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A Guide to The Pinetum . . . *Edmund H. Fulling*

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Vol- 14 No. 51

A GUIDE TO THE PINETUM

By Edmund H. Fulling

INTRODUCTION

I.—TO THE USE OF THE GUIDE

This Guide has been prepared for the purpose of supplying to students and others concerned some of the most interesting and important information regarding all the kinds of coniferous trees growing in the Garden. About 3,000 of these trees, consisting of approximately 225 different kinds, have gradually been collected. They are planted according to two schemes.

In the one, they are in groups botanically known as genera, such as the Pines, the Spruces, and the Hemlocks. Each genus, in turn, consists of one or more species as Red and White Pine, Norway and Tiger-tail Spruce, and Canada and Japanese Hemlock. All of these coniferous trees put together constitute the section of the Garden known as the Pinetum. This is the area treated in the Guide.

In the second scheme, the trees have been mixed in various places to form decorative plantings in which two or more genera may occur. These plantings are to be described elsewhere.

In the Pinetum there are eighteen different genera of trees and the Guide is divided into as many parts. The location of these genera will be determined from short descriptions and by maps. The latter indicate a starting point and a suggested route of progress through each group of trees. They also bear the names of some of the trees on the various areas. Obviously, the size of these maps does not permit mention of all the trees. Consequently, those that are indicated should serve as guides to others associated with them and mentioned in the text.

A few other points should become well fixed in mind:

1. Since the entire Pinetum lies south of the Museum, the direction "north" always means generally toward the Museum from any point where it may be given. Correspondingly, "south" will always be in the oposite direction, "west" to the left and "east" to the right, if one faces north.

2. The term "ahead" means in the general direction of travel as indicated on the maps.

3. The Guide endeavors to mention every individual needle-leaved tree that lies in the course of travel, but disregards all the broad-leaved trees, except one, that may be encountered. That one is the very first in the Guide, *Ginkgo*. Consequently, the Guide must be followed carefully that no trees are missed. If confusion does occur (which may happen through changes that time will bring), one may go ahead until he meets the next unquestionable tree and then work backwards.

4. Every tree in the Garden has been provided with a copper tag, 3½ inches long, which bears the tree's name. These tags hang on some branch at convenient height and always serve as a check.

5. If one wishes to see a particular kind of tree he must consult the index and find the page on which that tree is described. Then by turning back he will find the Section containing the tree and reference to a map locating it. The name of the tree may appear on the map and if not, he can find the tree by tracing through the section until he arrives at it.

Each group or genus of trees is considered in this Guide, first, by a specific consideration of the trees as they stand in the Garden. Then follows a general discussion of the genus as a whole.

Certain limitations must be appreciated in using this Guide:

1. It is obviously impossible to furnish all the information that every class of reader may desire. The trees are treated from the viewpoint of their popular identification, their economic and ornamental use and other interesting relationships. This information may prove sufficient for some and should serve as a stimulus for further investigation on the part of others. The Garden maintains a very large botanical library and a collection of many thou-

sand dried plants. Both may be freely consulted by anyone interested.

2. The names of plants in many cases have not become sufficiently standardized to give any one name precedence over others. All nomenclature and systems of classification are merely very painstaking attempts on the part of botanists to systematize our knowledge of over 160,000 different kinds of known plants. This figure does not include possibly 150,000 different kinds of "flowerless" plants, such as ferns, fungi, and algae. In the great majority of cases the scientific name of a particular kind of plant is sufficiently well established to carry no ambiguity as to what plant it covers. Common names, on the other hand, are very frequently misleading. It is a common thing for a tree to have a dozen different popular names and for the same name to be applied to several distinctly different trees. Scientific names have greater precision. But even they, too, once in a while, are confusing. Standard books on plants, however, usually list most of the scientific names by which a plant has ever been known and this assists in applying names correctly.

The greatest confusion of names occurs, probably, in the many horticultural varieties of Arbor-Vitae and "Retinospora." This will be mentioned again in the descriptions of these plants. The names given in this Guide have been selected more or less arbitrarily as best suited for the occasion. Ninety percent of them will cause no confusion at all.

A few definitions are in order here. The expression "species," as generally understood and used in this Guide, means a particular kind of plant found wild somewhere on the earth. Since the application of the term is purely man-made and since no two plants, however similar, are exactly alike, there sometimes arise questions as to whether or not two plants are sufficiently similar to receive the same name. If, in the opinions of experts, and they may differ, the differences are insignificant, then the two trees are regarded as one. If the difference is somewhat greater, one tree may be regarded as a variety of the other, and if their differences are great they are considered as two entirely different species.

In this Guide the term "variety" is applied to two different types of trees. The concealed distinction should, however, be borne in mind. In the one case it refers to natural variations that occur in the wild and which may be found in any batch of seedlings. An example is the well-known Colorado Blue-Spruce. Seeds from this tree will yield a mixture of green, "blue," and intermediately colored trees. This is the only strictly correct application of the term "variety."

Most of the so-called varieties in the Garden, however, are not true varieties. They do not occur in the wild from seedlings but have originated in another way. At various times and at various places, an individual plant of a wild species has produced an odd type of foliage, often on only one or two branches. When this occurred under the observation of gardeners, those odd twigs were usually removed and rooted in sand. By careful culture those cuttings grew into large plants whose entire foliage showed the character of the original odd twig. Once established in this way, thousands of plants have since been produced from the one original without the intervention of seeds. Such plants may be continuously either male or female or may have both sexes of flowers on them. Taken collectively, they are properly known as a "clon" rather than a "variety." The big majority of horticultural "varieties" among the evergreens are really clonal variations. The distinction, however, is not made in each case in this Guide.

3. Inaccuracies may occur in the Guide where trees mentioned are not to be found and, conversely, where trees found are not mentioned. This cannot be avoided, for occasionally a tree dies and must be removed; or, new trees are planted. Obviously, all these changes cannot be accounted for. However, they are not frequent and the liability of confusion from them is rather small. Newly planted trees are usually young and small. Some large old tree will generally serve to indicate approximately where the text may have become inaccurate.

II.—TO THE TREES DESCRIBED IN THE GUIDE

The trees described in this Guide are those which are commonly spoken of as evergreens, *e.g.*, Pines, Spruces, Hemlocks, and

Cypress. They are characterized, as a whole, by having needle-like or scaly leaves. There are other totally different evergreen plants, such as the Rhododendrons and Live Oaks whose leaves are broad and blade-like. Furthermore, the evergreens under consideration here are commonly known as conifers, for their fruit is a cone, which harbors the seeds. Coniferous evergreens, then, are, in general, the trees we shall consider.

But just as some evergreens are not conifers, so, some conifers are not evergreens. We shall meet three different kinds of cone-bearing trees which lose their leaves in autumn, the Bald-Cypress, Larch, and Golden Larch. And we shall see a tree which has broad leaves that are not evergreen and which does not bear its seeds in cones, the Ginkgo.

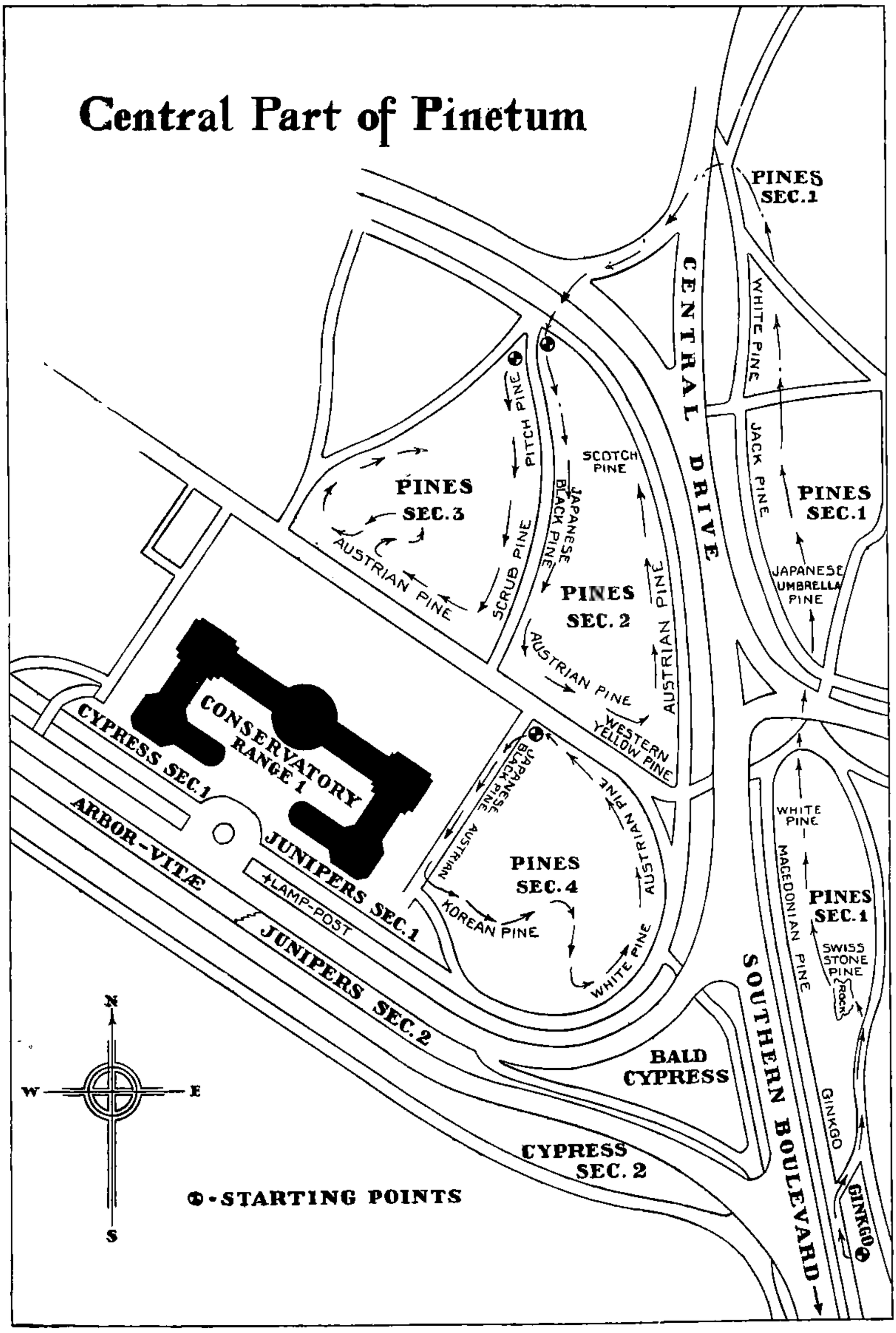
What, then, is the feature that justifies considering all these trees as a group? It is this. They all have true seeds and so have long been known by botanists as Spermatophytes or Seed-bearing Plants. Ferns, Mosses, Fungi, and Algae have no "seeds." But apple trees, peas, and pansies, among thousands of other plants, also have seeds, but we do not consider them here. The difference is that among approximately three hundred thousand different kinds of known seed-bearing plants all but about five hundred have their seeds imbedded in a pulp, capsule, or other container. The apple seed, for example, is inside the apple and a pea grows within a pod. All such plants are known as Angiosperms. The remaining five hundred do not, as a rule, have their seeds enclosed and these are known as Gymnosperms. The pine seed, for example, grows at the base of a cone scale, but is not enclosed in anything when ripe. This is the group to which all the plants described in this Guide belong.

The cone-bearing trees, which constitute almost all the Gymnosperms, are widely distributed throughout the world. Many are essentially tropical or so dependent upon local conditions that they cannot be grown outdoors here. The conifers of the north temperate zone, particularly the pines and spruces, supply the bulk of the world's lumber. In this country alone two-thirds of the lumber production is coniferous, or "soft-wood," as the trade refers to these trees.

During recent years coniferous evergreens have greatly increased in value as ornamental plants and this is the phase of their use considered primarily in this Guide.

Among the Gymnosperms or naked-seed-plants, the Ginkgo is the only non-cone bearing tree hardy enough to be of ornamental value here. Other coneless Gymnosperms, together with tender coniferous evergreens, may be seen in the greenhouses.

Central Part of Pinetum



PART I—GINKGO

A "LIVING FOSSIL" FROM PREHISTORIC TIMES

AN INSECT- AND FUNGUS-FREE ORNAMENTAL TREE

Starting on the eastern side of the Central Drive as it enters the Garden from Southern Boulevard and on the inside of the foot path along that side of the drive, we come to the first trees that we shall consider in following this Guide. (Map p. 7).

Three trees stand in a row just inside the low railing along the path. Behind them, scattered over the higher ground, are five more, similar trees. In winter their light-colored bark and few but widely projecting limbs are their outstanding characteristics. The numerous short spurs on these limbs bear wedge-shaped leaves in summer that distinguish the trees from others about. The trees themselves do not look at all like conifers. In fact, they are not true conifers, though in books one sometimes finds them described under Coniferae. They bear no cones, neither are they evergreen. They are trees that stand by themselves in the entire plant world and are known as

Ginkgo biloba, the Maidenhair Tree

The drive on the west side of the Museum is partially lined on both sides by these trees. Some of them are considerably larger than the ones before us now.

The Ginkgo is one of the most interesting of trees, for it is the sole survivor of a once great family that thrived in prehistoric times. As one writer has very appropriately pointed out, there is probably no other existing tree to which Darwin's term of "living fossil" may be so truly applied as the Maidenhair Tree. It is regarded as the oldest living type of tree, that is, in terms of plant evolution. It is closely related to no other living plants and is the only survivor from a type of vegetation that flourished during what is known as the Mesozoic Era. Its range extended then from what to-day is Australia, Cape Colony, and South America to northern Europe and Greenland. To-day it is nowhere known in the wild state.

FIGURE 1. Maidenhair Tree
Ginkgo biloba

Two very interesting questions naturally arise here: "What became of the relatives associated with the Ginkgo in prehistoric times?" "Why has the Ginkgo alone survived?" Any answer would be necessarily speculative and would be too involved for discussion here. The only thing that we know with reasonable assurance is that the Ginkgo, which we regard as a native of China, was preserved for us by the timely intervention of the Buddhist and Taouist priests. For long ages it has been cultivated about temples and shrines, court gardens of palaces and great mansions throughout China as well as in Japan, where it was probably introduced. It has been sought for by botanists in China but there is no authentic record of its existence outside of cultivation. We must then give thanks to the priests of ancient times who snatched this splendid tree from extinction at some remote date and preserved it for us.

From the Orient the Ginkgo was introduced into Europe and then brought to this country, probably sometime during the late eighteenth or early nineteenth century. To-day it is very widely planted as an ornamental tree and has proved well worthy of great use. In addition to its striking shape and attractive form, its principal asset is its possession of an unusual combination of characters scarcely to be found in any other tree. It is, so far as we know, free from both insect and fungous attack. Moreover, it is apparently unaffected by the poisonous gases and smoke common about cities and so fatal to many native trees. Finally, it is quite hardy as far north as Massachusetts, lower Canada, and southern Minnesota and thrives on a variety of soils.

The only objection that is sometimes raised against the Ginkgo has its basis in the disagreeable odor emitted by the fallen fruit. The fruit (really a seed) resembles a small yellow plum and its fleshy covering is rich in butyric acid, which gives an odor of rancid butter. This bad feature is apparent, however, only when the seeds have fallen and is scarcely noticeable while they are still on the trees. Furthermore, seeds as a rule are not borne until the trees are from 25 to 40 years of age. In addition, the fruit has been found to be poisonous to some, causing a very severe skin irritation similar to ivy poisoning in many respects. The

poison is in the outer fleshy layer. These two objections, however, may easily be avoided. Since the Ginkgo has the male and female flowers on different trees, the selection of male trees for planting eliminates the fruit. Notwithstanding statements to the contrary, it is practically impossible to distinguish between male and female trees by habit or foliage. The appearance of the flowers or fruit alone separates them. Though propagation by seed kept over winter and planted in the spring is quite successful, the percentage of male and female trees that will result cannot be foretold. Grafting or budding of known male stock is the recognized method of securing desirable material.

This same fruit, however, contains a sweet kernel which in China is roasted or eaten raw and highly esteemed as a dessert nut, supposedly having digestive properties. It is sold in China as *pa kwo*. In Washington, D. C., where many of these trees have been planted, the Chinese laundry men gather the fallen fruit for food.

The soft, straight-grained, light-brownish wood with a silky sheen is used for making abacus beads, seals, and other small fancy articles in China. In Japan it is extensively used for the ground work of lacquer ware and in the manufacture of chess boards and chess men. The Japanese use the leaves for fertilizer, especially in rice fields under water. Moreover, they ascribe to the leaves an insecticidal power and the leaf of the Ginkgo used as a bookmark, it is claimed, keeps away insects that attack books. Generally, however, the Ginkgo in the Orient has been associated with sentimental tradition and consequently it is not much used commercially.

Botanically, the tree is unique among living plants,* for it bears affinities with the conifers on the one side and with the ferns on

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* In all seedless plants, such as ferns, mosses, and algae, fertilization of an egg cell, when it occurs, is usually accomplished by means of motile sperm cells. Moisture is required at some point for these sperm cells to swim in by means of their moving hairs. This is a very dominant feature in these lower and less highly organized plants. In the seed plants, in general, however, the sperm cells are not motile but are produced in pollen tubes that assist the mechanics of fertilization. That is the process in perhaps ninety-nine per cent of the plants that ordinarily come to our attention. But there are two kinds of trees out of all the one hundred and sixty thousand kinds of seed plants known that show the primitive way of fertilization by motile sperm cells. One is the Cycad group and the other is the Ginkgo. The singular occurrence of this mode of fertilization in the Ginkgo is the most interesting feature of the tree to the botanist. The details of it cannot be discussed here.

the other. The Ginkgo obviously is a woody tree in every sense but one strange feature about it is the venation of the fan-shaped leaves. The veins extend in radiating lines to the upper border of the fan, as can easily be observed. Such venation, generally absent in other gymnosperms, may be indicative of some affinity with the ferns. It is, therefore, regarded as a transitional stage in the process of plant evolution from the lower more primitive and seedless plants to the more highly developed seed plants. The same applies to the matter of fertilization mentioned in the footnote.

The Ginkgo may attain a height of 100 feet and an age of 1000 years. Its name has come from the original Chinese term for this tree, while the common name, Maidenhair Tree, arises from the resemblance of the wedge-shaped leaves to the pinnules of the Maidenhair Fern, *Adiantum*. The flowers appear in April or the beginning of May and fertilization occurs in September.

Let us now follow the path that branches eastward from the main one we are on. It very soon meets another which we shall follow to the left. On our left now and extending a bit ahead we should notice five more Ginkgos of various heights. The first of these at the junction of the two paths is particularly narrow. It is one of the several horticultural varieties of this tree, and is known as the Columnar Maidenhair Tree, *G. biloba* var. *pyramidalis*.

We shall now go up the path we are on, which is parallel to the road and passes over the small ridge. The Ginkgos are on our left. The last of them is the smallest and quite undeveloped.

Just beyond we come to the first true conifers, the Pines.

PART 2—PINES

THE WORLD'S GREAT TIMBER TREES

VALUABLE LARGE ORNAMENTAL EVERGREENS

Section 1

Section 1 of the Pines is that portion of the Pinetum, not including the Maidenhair Trees, that borders the Central Drive on its eastern side from the Southern Boulevard entrance to a point opposite the Museum. It begins with the first evergreens near the last of the Ginkgos. (Map p. 7).

In order to view these first pines, let us stand on the highest point of the rocky formation that lies at the north end of the Ginkgos and at the beginning of the Pines.

The three similarly shaped trees to the extreme left are

Pinus Cembra, the Swiss Stone-Pine

Omitting the next taller tree to the right, the seven similar compact trees nearest the foot of the rocks more to the right are also Swiss Stone-Pines. Most prominently we notice the very compact, symmetrical, and rounded-pyramidal contour of these trees, a very pleasing feature that makes them highly desirable for ornamental use. It is a youthful shape assumed in cultivation, whereas, naturally, older trees are of taller and less compact habit. They are exceedingly hardy and slow of growth.

The Swiss Stone-Pine or, as it is sometimes called, the Arolla or Alpine Pine, has a very extended natural range. It is found in the central European Alps from Savoy to the Carpathians, and in northeastern Russia and northern Asia. In the valleys of the higher Alps it is the only tree capable of withstanding the elevation and intense cold. Herdsmen, as a result, have destroyed whole forests of these trees for firewood and today they no longer are so abundant as formerly. However, they still cover immense tracts of country in Siberia, Tartary, Italy, and Switzerland, reaching to an altitude of 6,000 feet in the Alps. In Siberia they become a dwarfed variety, *pumila,* and extend as far east as northern Nippon and Kamschatka.

The seeds of the Swiss Stone-Pine are nearly as large as hazel nuts, edible, and are much relished in Russia and Siberia. In that country the gathering of them constitutes quite an industry. From the shells, an oil is sometimes expressed that is used for fuel in lamps. Squirrels, too, are fond of these seeds. For these reasons the cones seldom remain long enough to yield mature seeds. One record, nearly a hundred years old, states that the kernels of the seeds furnished an important part of a Swiss dessert, and that an essential oil was obtained by distillation from the young shoots of this tree after they had been macerated and steeped in water for a month. The liquid whitish oil thus obtained was known as Carpathian Balsam and in Germany was believed to possess extraordinary health-giving qualities.

The wood of this tree is of considerable economic value in alpine regions where it is native. It is white, soft, and fine-grained, with an agreeable odor that is obnoxious to insects. It is consequently used for lining clothes-closets in addition to its use for wainscotting, upholstery, cabinet making, and turnery work; it takes paint and polish well.

The cones, which at first are purplish violet, later becoming brown, never open but fall when mature. The scales must rot away or be removed by man or beast to liberate the seeds. The needles are in groups of fives and the whole foliage is characteristically tufted. It is the only five-needle pine found wild in the Alps. Most distinctive of this tree is the prominent dense yellowish-brown hairiness on the young branchlets. The only other five-needle pine with which this one may be confused is the Korean Pine, *P koraiensis* (p. 42). In the latter the shoots are similarly hairy but the leaves are stouter and the teeth on their margins are more numerous and extend to the tip. The cones, moreover, are distinctly longer. The hairiness on the current-year shoots serves to distinguish the Swiss Stone-Pine from the next species,

Pinus Peuce, the Macedonian Pine

The remaining seven pyramidal trees in the group are of this kind. The first of them is just to the right of the first three Swiss Stone-Pines. These Macedonian Pines, too, are very fine,

but have a less rigid foliage, not so tufted and bushy, and the young branchlets usually show a smooth yellowish surface.

This tree has a very much more restricted range than the Swiss Stone-Pine. It is a native of southeastern Europe, being confined to three small areas in Macedonia, Bulgaria, and Montenegro, at elevations ranging from 2,500 to 6,000 feet.

From the contrast displayed in the planting it might be supposed that the Swiss Stone-Pine is normally smaller than the Macedonian. Both, however, may attain to a height of 100 feet in their native ranges. The Macedonian Pine, too, is a five-needle pine and together with the Stone Pine and the native Eastern White-Pine that we shall soon meet is regarded as one of the best five-needle pines for northern regions as far as Ontario, Canada.

The wood of this tree, though straight-grained and easy to work, has little commercial value outside its native country, and even there the difficulty of its extraction limits its usefulness. In this country the tree has only ornamental value.

One more pine tree in this group remains unmentioned. It stands farthest to the right and is of a very different shape from all the others in having spreading branches and a less compact habit. It is

Pinus parviflora var. **pentaphylla,** the Japanese White-Pine

We shall meet other specimens of this tree and gradually notice certain distinguishing features about the leaves—their short tufted habit at the ends of the branches, a certain delicateness about them and their glaucous hue. Their shortness and whitish lining serve to distinguish this one from other five-needle pines. Moreover, the flat-topped head is characteristic of mature trees. It is one of six different pines native to Japan and is the Japanese representative of our Eastern White-Pine.

The Japanese White-Pine is not normally a tall tree, averaging from 40 to 60 feet in height, though occasionally it may attain 90 feet in the forests of Japan. In cultivation, however, it seldom is over 20 feet high. To the Japanese it is known as *Goyo-matsu* and *Hime-komatsu.* Its wood is used for general

construction purposes in Japan, and the trees themselves are extensively cultivated for ornamental purposes. They are the favorites of the Japanese gardeners for pot culture and are dwarfed and trained into many kinds of fanciful shapes. These gardeners graft this pine and others on the stock of the Japanese Black-Pine, *P. Thunbergii* (p. 28), which tree we shall see later. This operation of grafting a soft on a hard pine is, as a rule, unsuccessful. But in the hands of those skilled workers the natural incompatability is partially overcome and the stunting results in the odd forms we recognize as Japanese.

This species, though it grows wild in Japan, seems to have been named a variety, var. *pentaphylla,* of the tree which is much cultivated in Japan, *P parviflora.* This apparent departure from the usual practice in horticulture according to which varieties are generally named as forms of the wild type probably arose from the fact that the cultivated form might have been known and studied before its wild form was described.

Leaving, now, our position on the rocks, we shall walk through the group toward the evergreens farther ahead. Just beyond the last Macedonian Pine we pass a splendid black gum tree, leafless in winter, which in its beautiful autumnal coloration is one of the choicest sights in the Garden. To the left are a few elm trees. Just beyond and to the right of the black gum stands our next evergreen, one of open formation and very different habit from the close growth of the Stone Pines and Macedonian Pines. Its leaves are slender, quite long, grayish or bluish green and droop pronouncedly. Right ahead of us in a diagonal line with it are two others. These trees are

Pinus nepalensis, or **P. excelsa,** the Himalayan White-Pine

This tree is native to the temperate Himalayan region at elevations ranging from 6,000 to 12,500 feet between Nepal on the east and Afghanistan on the west. In its native habitat it attains a height of 50 to 150 feet and is one of the important timber trees, furnishing lumber for a great variety of purposes. Its fairly hard and durable wood works and finishes well. First class rosin and turpentine are obtained by distillation of the resin secured by

tapping. In fact, next to *Cedrus Deodara,* the Deodar, this Bhutan Pine, as it is sometimes called, is the most important coniferous tree of its region. The roots yield an oil used to anoint the arms and legs of natives as a protection against water insects while they work in the wet rice fields. During the dry winter seasons there is a copious sweet manna-like exudation from the leaves which is collected and eaten by the natives.

This species, with five needles in a cluster, is distinguished from all other pines of that class by its large horizontal lower branches and long drooping needles. These two features will become more apparent when we meet larger trees in Section 4. There we shall see that because of the persistence of the lower limbs that hang close to the ground and turn up at their tips this tree must be given plenty of room in ornamental planting. The pendent leaves that droop from the lower limbs of mature trees are especially attractive.

All the remaining eleven pine trees in this immediate area as far as the road ahead of us, including one that is separated from all the others by the diagonal row of three Himalayan White-Pines, are

Pinus Strobus, the Eastern White-Pine

This is the only five-needle pine native to the eastern United States, where since the advent of the Pilgrims it has been the most valuable forest tree. The vast forests of it that once covered the northeastern section of the country as well as a good part of the Lake States were the bulwarks of this country's early industries. But these vast forests no longer remain, for they have for the most part fallen before the axe. From 1620 to 1840, white pine was the chief timber of New England, and during that period the reserve was reduced from 400 billion board feet to 10 billion feet, a reduction of 97½%. In 1892, after lumbering had shifted to the wonderful white pine forests of the Lake States, 10 billion feet were cut and since then the annual production has steadily decreased. This gives some idea of the inroads that have been made on a great natural resource.

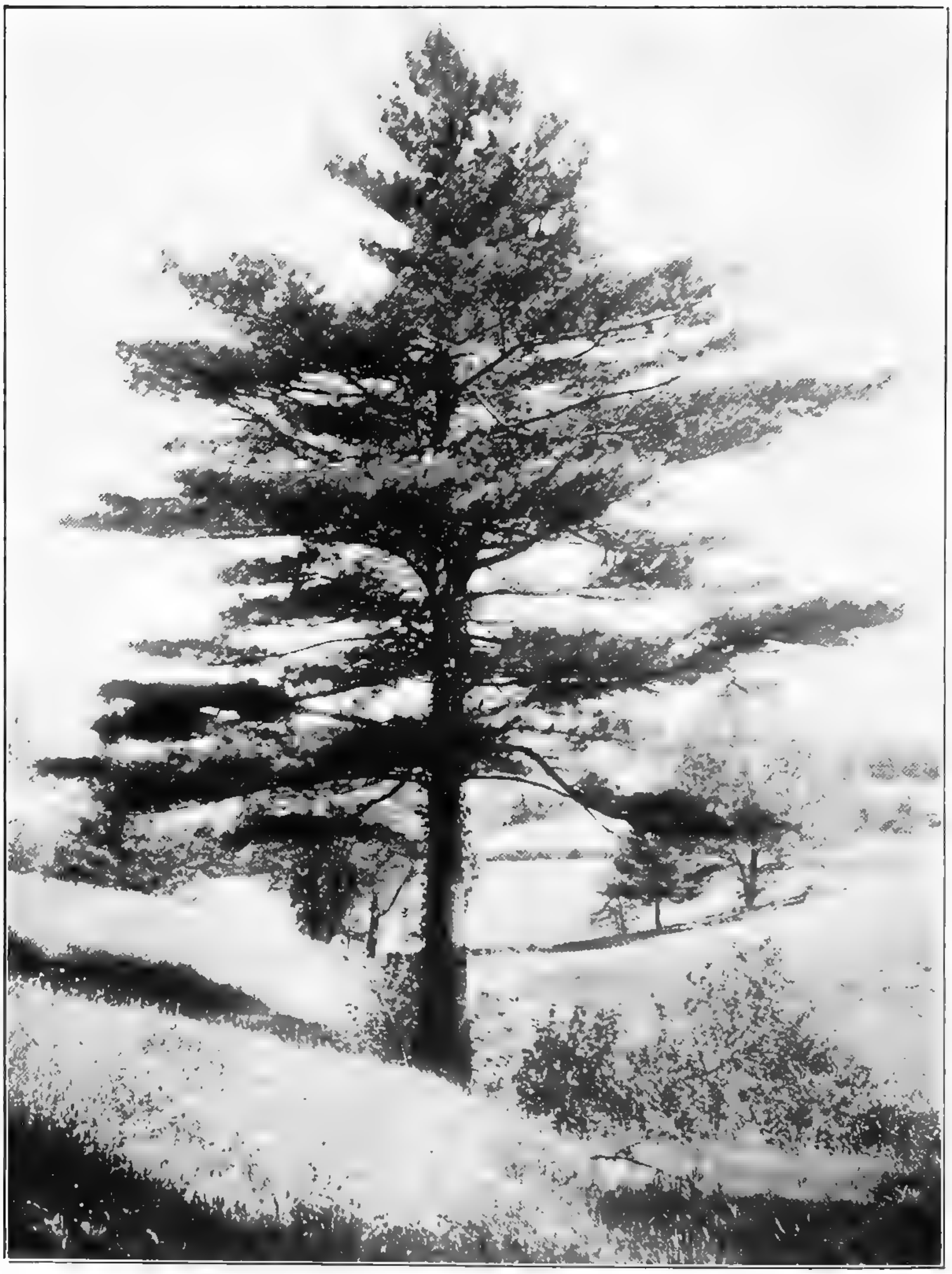

FIGURE 2. Eastern White-Pine
Pinus Strobus

Pinus Strobus is a native of eastern North America, extending from Newfoundland to Manitoba and throughout the United States from Minnesota to the Atlantic and south along the Appalachians to northern Georgia. It is the tallest conifer east of the Rockies and records exist of trees up to 260 feet in height and 20 feet in girth. Today, however, trees 150 feet tall are uncommon. The wood has always been regarded as one of the finest and most valuable in this country. It is straight-grained, soft, easily worked and finishes well, with a fine even surface. It takes paint and polish well and when once it has been properly seasoned it rarely checks. Its wide uses include almost every wood-utilizing industry in the country, from indoor trim and cabinet work to aircraft and shipbuilding.

In addition to the intrinsic value of the wood, white pine is one of the best species for reforestation purposes in the northeastern United States. It is unquestionably the most important forest tree in eastern North America and, as one authority states, probably in the world. It is being much used for reclamation work and in Pennsylvania, where much attention is given to forestry, twenty million young white pines were planted during a recent period of eighteen years on the state forests. An additional ten million trees have probably been set out on private lands in that state. New York, Massachusetts, and Connecticut have done similar work. Nursery stock is used for this purpose and it is interesting to note here that the cones of white pine yield from 50 to 75 seeds each, that from 25,000 to 35,000 of these seeds are required to make a pound of clean seed sufficient to sow 100 square feet of nursery bed and that each bed can produce from 10,000 to 15,000 two-year-old seedlings.

The white pine has been extensively introduced into Europe with marked success. In 1705 it was brought to England by Lord Weymouth and in that country it is most commonly known as Weymouth Pine. In 1794, a Hessian forester who was visiting America returned to Germany with sufficient white pine seeds to reforest 15 acres of woodland near Trippstadt in Bavaria. Years after, when the forestry movement in the United States was in its infancy and nurseries could not yet supply the needs, white pine

FIGURE 3. Columnar White-Pine
Pinus Strobus var. *fastigiata*

seedlings were imported from Germany for reforestation purposes from those very trees that, in the form of seed, originally went from this country. Throughout continental Europe white pine has been planted to such an extent that it is now regarded as a naturalized member of the forests there.

To return to the group at hand we should observe that the splendid tree in the center toward the northern end differs from the others. Its branches are not so horizontal but rather ascending. It is a beautiful thing, indeed, but its beauty is somewhat marred by its setting here. If we look across the road on our left we see a similar tree between the road and path on that side, pyramidal in contrast to the other three white pines adjoining it to the right. These particular trees represent a natural variety of the common white pine, known as Columnar White-Pine, *Pinus Strobus* var. *fastigiata* or var. *pyramidalis*.

Pinus Strobus is further characterized by having its bluish-green and somewhat feathery-looking foliage distributed in horizontal masses along the branches which occur in regular whorls. Furthermore, there are tufts of hair below the insertions of the leaves. Especially in old age is white pine a thing of beauty, when a tall bole bears high up near its crown far-reaching limbs that seem to be horizontal arms supporting platters of upright tufts of leaves. At this stage in the life of the tree the needles do not appear below their main boughs. We shall see some of these veterans just beyond the road ahead of us and elsewhere other fine specimens occur in the Garden.

It would be unfair not to mention the two weaknesses of the white pine, for they play a tremendously important role in the reforestation of this species. They are the susceptibility of the tree to the ravages of an insect pest, the white-pine weevil, *Pissodes Strobi,* and the fungus, *Cronartium ribicola,* which causes the white-pine blister-rust. It is not within the compass of this book to discuss these destructive agents, but their importance is so great that they must at least be mentioned.

As an ornamental, white pine is extensively planted in this country. There is little of distinctive beauty, however, in the young trees.

FIGURE 4. Dwarf Japanese Red-Pine or Japanese Umbrella-Pine
Pinus densiflora var. *umbraculifera*

The last of this group of white pines stands with its crown cut off in the little triangular patch between the path and the road that runs to the east, ahead of us.

We must now cross this road and on the other side we meet the pines again. The first to attract our attention are the nine bushy ones right in front of us. There are seven of one kind and two of another. The seven are those with the somewhat scaly yellowish-brown or reddish bark with the leaves in a more or less rounded head, leaving the lower part of the plant open. These trees are

Pinus densiflora var. **umbraculifera,** the Japanese Umbrella-Pine

This is one of the best of several garden varieties which the Japanese have developed from their native red pine. To them it is known as *Tanyosho.* It is one of the choicest varieties of conifers for decorative purposes, attaining a height of twelve feet. The leaves are in groups of twos, offering us our first contact with such leaf arrangement. All the pines so far have been of the five-needle type.

The other two bushy pines associated with these seven are conspicuously different; their leaves are in threes, occasionally more or less. They are

Pinus Bungeana, the White-bark or Lace-bark Pine

This pine is native to western China, where in maturity it is one of the most conspicuous and attractive trees. Its oddity lies in the fact that it sheds its bark much as the plane tree or the birch, exposing a white trunk that presents a striking contrast against the green of other conifers frequently associated with it. This trait is already indicated on the trees before us, for on the trunks yellow patches appear as a result of exfoliation of the outer bark. It is not, however, until an age of about fifty years is attained that the whiteness appears. This peculiar habit, shown also by the White-bark Pine of the western United States, *P albicaulis,* is an anomaly, so far as pines are concerned.

Though of a bushy habit in cultivation, the White-bark Pine

attains to a height of 80 or 100 feet in its native range. The foliage is rather distinct, being sparsely arranged, rigid, acute, and light green and having a turpentiny odor when bruised. This tree, much as the Ginkgo, has been cultivated to a considerable degree about the shrines and temples in China, especially at the Buddhist monasteries in the mountains west of Peking. To the natives it is known as *Pai-koo-sung*.

Little is known of the wood of this tree and in its native land it is not sufficiently abundant to be of commercial importance.

To the right, ahead of us, we come to three trees in a row, which may appear to be Scotch Pine, if we already know that species, because of the orange-colored bark and resinous buds. But closer examination will show that the leaves, though in twos as in the Scotch Pine, are longer and not so stiff and are green rather than bluish-green. Moreover, the branchlets are glaucous, that is, they have a bloom. There is another similar tree before these three that stands higher up on the slope and just about directly east of the White-bark Pines. These four trees are

Pinus densiflora, the Japanese Red-Pine

This is the tree of which the Japanese Umbrella-Pine is a variety and which is cultivated in numerous other forms by the Japanese. It is known to them as *Aka-matsu* and is regarded in Japan more as a forest tree than one of gardening use. It grows to a height of over one hundred feet and has been abundantly planted on barren soil, for it will grow on the poorest sites. The wood of this species, which is coarse-grained but moderately strong, is used for every description of carpentry by the Japanese.

The remaining six pines in this area as far as the next path, beginning with the tall ones along the road next to the White-bark and Umbrella-Pines, are

Pinus Banksiana, the Jack-Pine

This tree possesses little beauty to recommend it for ornamental planting. It is scraggly, unkempt-looking, and relatively short-

lived. Sixty years is a maximum age and thirty feet an average height. Seventy feet may occasionally be attained. But it has distinct value in its ability to withstand conditions where other trees would fail, particularly on dry and sandy soils. It is frequently used for reclamation work on such sites and is one of the first trees to return naturally to burned-over and denuded areas. It is drought-resistant and the most intolerant of shade among our northeastern pines. Though it thrives on very dry sites by extending its roots several feet after water, it may also live in swampy land. Its growth rate, moreover, is considerably greater than that of any other pine in its region, another feature that recommends it for reclamation use.

The light, soft, and weak wood of the Jack Pine has little lumber value. It has, however, entered into the manufacture of various secondary products. The Indians used it in making canoes.

The two most distinguishing features of the Jack Pine pertain to the leaves and cones. The former are in groups of twos; they diverge and are the shortest needles found on any native pine, being about one inch in length. The mass effect of all the diverging needles on a well-covered branch is very characteristic. The cones, up to two inches in length, are generally curved or lopsided, bear no stem and persist for many years, sometimes twelve to fifteen, and remain unopened for a great period. The result usually is a tree laden with a mass of crooked cones, some wide open, others tightly shut.

The Jack Pine, known also as Gray, Banks' and Banksian Pine, is the hardiest of American pines, penetrating farther north than any other pine and rivaled by few other trees. It extends to within one and a half degrees of the Arctic Circle as a low and dwarfed shrub. In fact, it is almost transcontinental in distribution, reaching from Nova Scotia across Canada to the southeast corner of the Yukon region. It is, therefore, distinctly northern, though it extends southward to the southern shores of Lake Michigan. Its dwarfness in its most northern reaches is a feature shared by all trees that have such an extended range. They all become stunted in high latitudes as well as in high altitudes.

In the next triangle between converging paths are three native white pines, *P. Strobus*. Five more skirt the main path along the road beyond the triangle. To the east of the first of these five stands a Japanese White-Pine and above it are the two veteran native white pines already referred to. It is very obvious here how different this tree appears in old age as compared with the younger specimens below it. Behind the last native white pine along the road stands another Japanese White-Pine above which on top of the mound is another similar specimen of the same kind. The remaining four low and bushy evergreens beyond along the path are

Pinus parviflora, the Japanese White-Pine

This is the dwarfed form of those we have just passed. It was mentioned at the very beginning of our study in this Section. Above the last of these low plants and near the edge of the hard-wood thicket the slender evergreen is *Pinus parviflora* var. *pentaphylla,* the wild form of the Japanese White-Pine and the same as the three we have just passed and the one back with the Swiss Stone-Pines. There has been some discussion concerning the relation of these two forms in an effort to determine whether one is a variety of the other and if so which is which. It matters little to us, however, and we may safely consider either one of them as a variety of the other.

Above the last of these at the edge of the woods, is another Japanese White-Pine.

Section 2

Section 2 of the Pines lies on the western side of the Central Drive through the Garden which separates it from Section 1, and south of the cross road in front of the Museum (Map p. 7). To reach it from the end of Section 1, go a bit southward along the main road and follow its first bend to the right. A little beyond the triangle at the junction of the roads and on the south side of the drive in front of the Museum we see a path that branches to the right and to the left over the knoll. We shall follow the left-hand branch and consider the pines between this path and the main road, in other words, the trees on our left.

First we pass two Red Cedars (p. 112), and then come to a large dark-foliaged tree that looks like an Austrian Pine, if we already know that species. Three similar trees stand just opposite on the right-hand side. These trees are a variety of the Austrian Pine and are known as

Pinus nigra var. **Pallasiana,** the Crimean Pine

This variety is a native of western Asia. There is scarcely any apparent difference between it and the Austrian Pine, and it is most difficult to distinguish them. The variety is said to be distinct in its pyramidal habit, with the main branches growing erect. More will be said concerning these trees when we reach a very fine collection of large Austrian Pines farther on in this Section. Another but less developed Crimean Pine stands next along the path, set back a bit.

The next five evergreens on our left, together with an additional one which stands opposite on the right-hand side, are

Pinus ponderosa, the Western Yellow-Pine

This tree, so far, is relatively unimportant ornamentally in this section of the country.

It is the most widely distributed pine in America, ranging from southern British Columbia south to Mexico and east to South Dakota. In such a range, covering a million square miles, we find geographical variations as we do in other trees of similarly extended distribution. Of three such variations we shall see one a little later, the Jeffrey Pine. In addition, there is an altitudinal variation, for at timber-line in the higher mountains this tree becomes dwarfed.

The Western Yellow-Pine is the most abundant and important hard pine of the West and one of the great American lumber trees. Its annual cut amounts to about two and one-half billion board feet, exceeded only by that of the southern yellow-pines and Douglas Fir. Immense tracts of territory, especially in northern Idaho and Montana and elsewhere in the western states, are covered with this tree. Probably two hundred and fifty billion board feet of this timber still remain in the Western States, exceeded

only by Douglas Fir and by the combined stand of the four southern yellow-pines.

In the trade, it is extensively used in general construction work and in almost an unlimited variety of other capacities. The wood is lighter and softer than that of the southern yellow-pines and shows less definite transition between spring and summer wood.

In its native range, this tree may become 150 feet tall and occasionally 230 feet, with diameters ranging from five to eight feet; in fact, it is the tallest of the pines next to the Sugar Pine of California, *P. Lambertiana,* which species unfortunately is not represented in the collections.

As with many other trees of extended distribution, the Western Yellow-Pine bears a series of common names. On the coast it is sometimes erroneously known as California White-Pine. The standing timber is called Bull Pine. It is also often known as Heavy Pine, but that term serves merely to distinguish it from the considerably lighter Sugar Pine. In Montana it is Black Pine and elsewhere it has received the name of Sierra Brownbark Pine.

In addition to insect damage, this tree in the southern portion of its range is seriously injured by a mistletoe. This parasite, whose relatives, generally, are regarded as harmless to their hosts in the East, causes considerable destruction to several western conifers.

The leaves of the Western Yellow-Pine are prevalently in threes, though occasionally they will be found to vary from two to five. They are conspicuously long, five to eleven inches in length, and occur in great clumps with a characteristic appearance.

The taller evergreen behind these yellow pines and close to the shrubbery in the background is another Red Cedar (p. 112).

The next five larger trees ahead of us, three of which are more removed from the path than the others, are

Pinus Thunbergii, the Japanese Black or Thunberg Pine

This species from Japan is truly Japanese, with its characteristic leaning trunk and broad irregular head. In fact, it is the tree that has probably influenced Japanese art more than any other, for it is a familiar subject on paintings, wood-carvings and em-

FIGURE 5. Japanese Black-Pine, *Pinus Thunbergii*, along path, and Jersey Pine, *Pinus virginiana*, on extreme left.

broideries from Japan. To the Japanese it is known as *Kuro-matsu* and has become so endeared to them that with the exception of the Cryptomeria, which we shall meet later, it has been more widely planted than any other tree. The great highways of old Japan were lined with great numbers of these trees.

As a potted or dwarfed and contorted tree, the Black Pine is very frequently seen in the Japanese miniature gardens. It is also trimmed into fancy hedges and other expressions of clever topiary work. Moreover, it is the species used in Japan as stock for grafting all the other pines and their varieties as, for instance, the Japanese Umbrella-Pines, which we have already encountered.

In addition to its horticultural value, the Japanese Black-Pine is one of the important forest trees of Japan, where, in the wild, it grows to a height of 130 feet. Its wood, though similar in appearance to that of the Japanese Red-Pine, is coarser-grained, more brittle, more resinous, and except for fuel is of considerably less value. It is a species, however, which thrives on both good and bad soils and consequently is much used for reclamation work on sandy sites. Furthermore, it is suited for seaside planting.

The clumps of needles of this pine form a most distinguishing feature, particularly from a little distance. They appear in groups of twos that seem to have been cut off evenly into nicely rounded tufts. The branchlets are orange-yellow, and the winter buds frequently are conspicuously large and silvery.

Three more of these trees stand directly opposite on the right-hand side of the path.

We now ascend the slight incline ahead of us, following the path, pass the rocky formation on our left, and soon come to a small pine near the path. It is

Pinus sinensis, the China Pine

This is a relatively unimportant tree from the cold-temperate and subalpine levels of the mountains of central and western China and from Korea. The leaves vary in number but generally occur in twos. The wood of this species has been used in China for general construction purposes and shipbuilding.

We now come to the large planting of Austrian Pines already referred to. Some stand along the ridge to the right; all the trees to the left except a few to be pointed out are of this kind. They are

Pinus nigra, the Austrian Pine

This is perhaps the most successful foreign kind under American conditions. It is entirely hardy and endures exposure unusually well, even by the seashore. In this respect it surpasses the hardy Scotch Pine and competes with that more northern tree in beauty as well. It succeeds in very poor or even limy soil, in heavy loam and clay, and thrives in the pure sand of the beach. Its remarkable resistance to strong sea-breezes makes it especially valuable as a shelter tree for more tender stock, as Scotch Pine, and for human habitation.

The Austrian Pine is widely distributed in southern Europe from Spain to the Crimea and the Caucasus and in Asia Minor to the Taurus Mountains. Consequently there are several geographical varieties, of which we have already met one, the Crimean Pine. In their native range these trees attain heights up to 100 and 150 feet.

Resin has been obtained by tapping the Austrian Pine, but insufficiently to result in serious competition with that secured from the Maritime Pine, *Pinus Pinaster,* the principal source in Europe.

In this country the Austrian Pine is very extensively used in decorative planting. Its growth is remarkably rapid and its success is usually assured. The dark needles in groups of twos, up to half a foot in length, occur, with a characteristic twist, in great clumps.

As we go eastward now along the south side of this Section that faces the large greenhouse we should notice three trees with orange-colored bark. They are laden with cones and stand apart just below the darker and denser Austrian Pines on the crest. They are *P. densiflora,* (p. 24), the Japanese Red-Pine, the same as those we met in Section 1.

Above the most easterly one of these Japanese pines stands a

smaller evergreen. It is the Jersey or Scrub Pine (p. 39). We shall postpone a description of it until we meet more specimens in the next Section.

The remaining five trees on this side of the slope we should recognize as Western Yellow-Pines, with their needles in threes.

The small evergreen of scanty foliage that grows on what might be termed the dividing line between the eastern and southern faces of this slope is

Pinus Jeffreyi, the Jeffrey Pine

This is one of the hardy western pines found from southern Oregon to Lower California, where in certain areas it forms extensive forests. Its leaves are longer than those of any other hardy native pine. It is a mountain tree and generally occurs above the Western Yellow-Pine at elevations of 3,600 feet in the north to 10,000 feet in the south. It is regarded by some authorities as a variety of the Western Yellow-Pine, from which it is distinguished principally by its more pungently aromatic resinous secretions and its stiffer and more elastic leaves, which persist on the trees for a longer period.

The Jeffrey Pine is also known as Black, Redbark, Blackbark, Bull, Sapwood, and Truckee Pine. In the trade it passes as Western Yellow-Pine.

The three-needled pine north of this Jeffrey Pine and between the path and the bigger Austrian Pines on the slope is a Western Yellow-Pine.

The remaining large dark-foliaged trees along the slope facing the road to the east as well as those on top of the knoll are Austrian Pines. There is one odd conifer high up on the rocky formation at its northern end. It is a Red Cedar (p. 112).

Beyond the last of the dark Austrian pines along the path are the last two trees in this Section. They have bluish-green needles and orange-colored bark. They are

Pinus sylvestris, the Scotch or Scots Pine

The Scotch Pine, like the Austrian, has shown remarkable adaptability to American conditions. It is one of the most dependable of foreign trees and is very valuable for ornamental purposes. On dry sandy soils and in exposed situations it thrives unusually well; the Austrian Pine, however, is more resistant under severe exposure. The Scotch Pine, furthermore, is one of the most rapid-growing conifers, at least during youth. This feature, together with its hardiness, makes it especially useful for forming screens and as a shelter tree for more tender stock. It seems singularly capable of thriving in regions of hot summers and cold winters. Old trees are especially picturesque, for their frequent odd shapes and colored bark are very effective.

The Scotch Pine is a native of Europe, where its range covers most of the continent, extending from southern Spain and northern Italy to latitude 70 degrees on the west coast of Norway; thence east through Lapland and Siberia along the Arctic Circle to the Amur and thence through Asia Minor to Persia. It is the most widely distributed of the pines. In Europe it is absent only from the southern portion of the Balkan peninsula. In elevation it ranges from 700 feet in northern Norway to 6,500 on the Sierra Nevada of southern Spain. In the forests of Europe the Scotch Pine may attain to a height of 120 feet. It grows there in dense stands of beautifully tall and straight slender trees, which may attain an age of three and four hundred years. As seen in this country, it generally assumes a rounded shape and frequently distorted growth because of lateral freedom.

In Europe the Scotch Pine has figured very prominently in the practice of forestry, for it is one of the major forest trees on the continent. The uses of its lumber are almost limitless. At one time, at least, tar, pitch, and turpentine were made from its resinous juices. These and other products are obtained by destructive and steam distillation of the wood. In Lapland and northern Russia the bark has been used for covering huts and many other purposes. Stump oil and resin are secured from the roots. The fibre of the leaves has been manufactured into stuffing material

for cushions, mattresses, and other articles, under the name of pine-leaf wool. The water used in this operation has been used further in Breslau and elsewhere for medicinal baths. Oil obtained from the leaves is sometimes used in medicinal practice. In Ireland, where very old trees have lain for centuries in bogs, shavings have been made from the dug-up trees and utilized for coarse rope.

The Scotch Pine may generally be recognized by its orange-colored bark, particularly prominent on the upper part of the trunk and its bluish-green foliage. The bark, moreover, is inclined to be scaly and the twisted bluish-green leaves occur in twos. It was mentioned previously that this tree might be confused with the Japanese Red-Pine. This latter stands just across the road and it might be well to step over there and note the difference in the leaves. The backward-pointing cones on the branches of the Scotch Pine, when present, are a further mark of identification.

There are numerous varieties of the Scotch Pine, geographical and horticultural. Much of the timber exported from northern Europe is known as "Riga," "Dantzic," or "Yellow Deal." Such an important and widely distributed tree, it should be expected, would bear a burden of names. The Scotch Pine is probably unexcelled in this respect.

Behind these two Scotch Pines are the Japanese Black-Pines we considered from the other side of the Section.

Section 3

Section 3 of the Pines lies on the western side of the path that separates it from Section 2 (Map p. 7). It is the triangular area directly behind Conservatory Range 1, bounded on both eastern and western sides by paths. We shall begin at its northern end, for it terminates there in an apex where the two bounding paths converge. We shall follow the path along the eastern side of the Section. If we have just completed Section 2, we need but return to where we began on that Section and direct our attention to the right-hand or western side.

The first three large pines that stand in the apex are the same as the one on the left side of the path which we have already considered, the Crimean Pine (p. 27).

The next tree with long scant foliage along the path is

Pinus Sabiniana, the Digger Pine

This pine is of almost no ornamental value here, for though odd in its heavy trunk and sparse foliage, it is not sufficiently hardy.

The Digger Pine is confined to the western part of California, where it inhabits the foothills of the Coast Ranges and of the Sierra Nevada, almost the entire length of the state. It ranges between elevations of 250 and 4,000 feet. It attains a height of 50 and occasionally 80 feet and is characterized principally by thin, pendulous foliage and crooked straggling branches, which set it apart from all other accompanying coniferous vegetation. The leaves are in groups of threes, 8 to 12 inches long. The young shoots when cut have the same orange-like odor as the Western Yellow and Jeffrey Pines.

The wood of this tree is of little economic importance but the edible seeds have served as food for the Digger Indians, whence the common name of the tree. It is also known as Bull, Gray, Gray-leaf, Nut, and Sabines' Pine.

Directly west of the Digger Pine the three low bushy evergreens, somewhat isolated from the other pines about, are

Pinus Murrayana, the Lodgepole Pine

This pine, too, is of comparatively little ornamental value in this part of the country for under cultivation it assumes a bushy rather than tree-like habit. It also is a native western tree, but differs from the Digger Pine in its very extensive range. It is found from the valley of the Yukon, near the Alaskan boundary, along the Pacific Coast to central California and eastward as far as the Black Hills. It becomes common at an elevation of about 7,000 feet and in southern California it ascends the mountains to 11,000 feet. Great stands of Lodgepole cover the western states in the northern Rockies, where they are the most common conifers, attaining a height of 100 feet or more.

The common name, Lodgepole, has arisen from the use made by the Indians of these trees for the center pole in their lodges.

Other names that have been associated with it include Black, Murray, Pitch, Prickly, Red, Spruce, Tamarack, Tamrac, and even White Pine.

The Lodgepole Pine is characterized by very short needles in twos and orange-colored branchlets. From other two-leaved pines it may be distinguished by the twisted or stunted appearance of the branches, the short twisted yellowish-green leaves and the long buds encrusted with resin.

The lumber of this tree is inferior to that of other western pines, though it is employed to some extent for local purposes. The greatest value of the species probably lies in its peculiar ability to regenerate cut-over and burned lands. The trees themselves suffer severely from fires but are otherwise benefited, for through conflagration the seeds which are sealed in the cones by accumulated resin are liberated and allowed to germinate. Reproduction on burned over areas, consequently, is very good. Moreover, the seeds themselves have remarkable vitality and in spite of long imprisonment that may occur before liberation they do not seem to suffer.

The Lodgepole Pine very frequently is regarded not as a distinct species but merely as a variety of the western coastal Scrub Pine, *P. contorta*. It is usually found under more favorable conditions than the Scrub Pine and the difference may be entirely due to soil and shelter. The growth is more vigorous, the leaves are broader and the cones larger. Like most conifers, the Lodgepole objects to limestone. It gives excellent results, however, on dry gravelly soils and is very intolerant of shade.

The next four larger trees farther along and set back from the path are

Pinus rigida, the Pitch Pine

The Pitch Pine offers little of ornamental value unless its scrubby appearance just suits a particular location. On dry rocky slopes or sandy areas it may be the only successful tree along with the Jack Pine and there become very picturesque when old. It is hardy and growth is quite rapid.

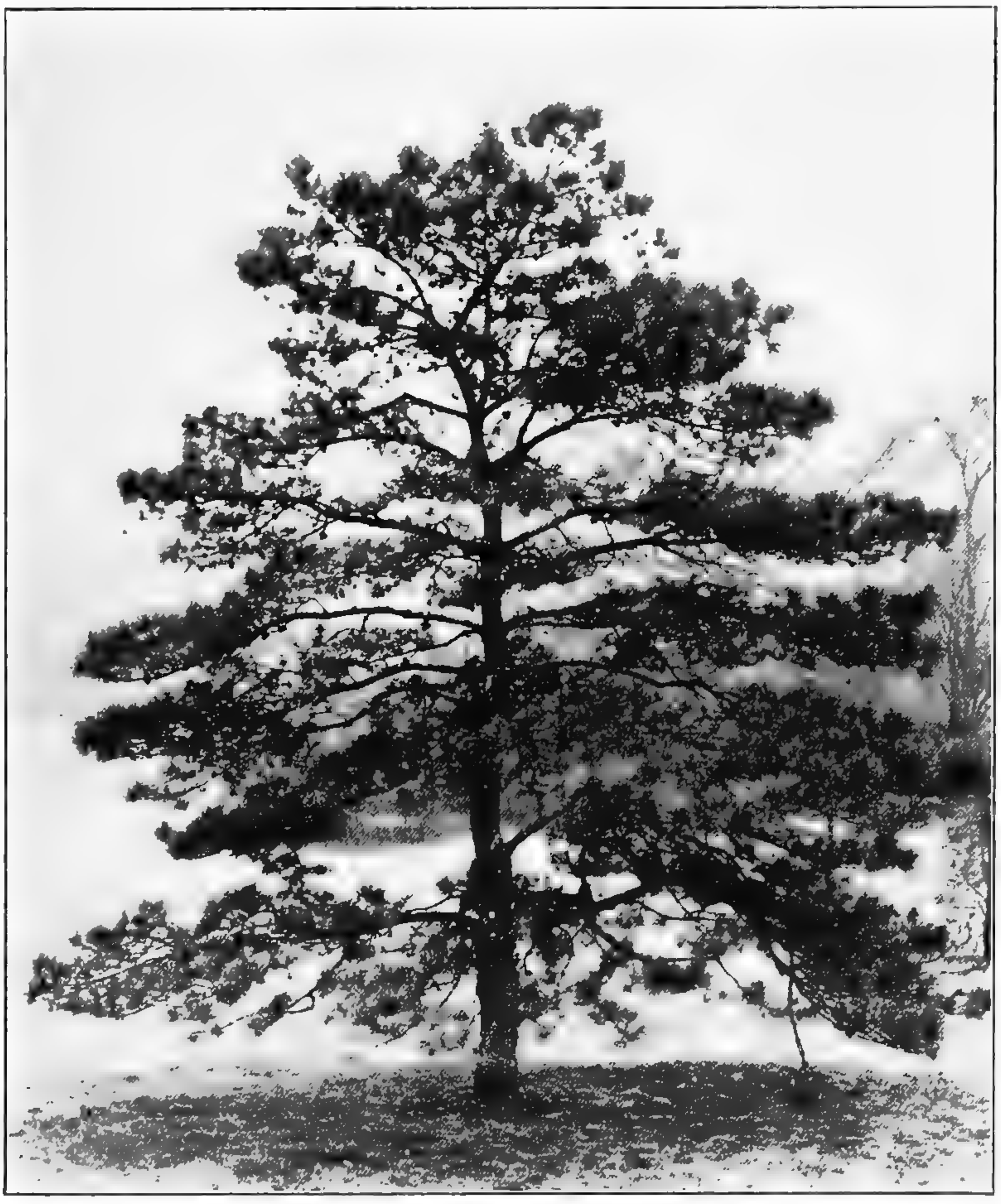

FIGURE 6. Pitch Pine - - -
Pinus rigida

It is the only native pine in this section of the country with leaves in threes, which, consequently, is an unfailing mark of identity if it is certain that such a tree has not been imported from outside the region. Furthermore, as may be observed on the specimens at hand, the trunk may be covered with great masses of leaves. The Pond Pine of the South, *P. serotina,* shows this peculiarity, too. This feature is evidence of a trait peculiar among conifers to this species, namely, that of producing sprouts. It is characteristic of broad-leaved trees, but rare among the conifers. The Redwoods of California exhibit the same ability to a very marked degree. The sprouts of Pitch Pine, however, are short-lived and do not constitute a very successful method of reproduction as sprouts do in the Redwoods.

The Pitch Pine is a typical hard pine of the northeastern United States, ranging from Maine westward to Ontario and Ohio and southward along the Appalachians to northern Georgia and Tennessee. In New Jersey and the Delaware Peninsula it forms extensive forests. It may attain a height of 80 feet, though usually is not over 50.

The wood has always held a secondary place on the market in comparison with better species, such as White Pine. But with the disappearance of those better woods and with improved forestry practice Pitch Pine as well as other less important pines in the East will undoubtedly gain in favor.

One of the common names of this species, Torch Pine, arose from the extensive use by early settlers of the pitchy pine knots for torches about homesteads and for traveling at night. It formerly was the chief source of turpentine and rosin but is now superseded in this respect by the Longleaf Pine of the south, *P palustris.* This latter is the American pitch-pine found in European markets. Tar made from the true Pitch Pine was the pioneer's axle grease.

In Delaware it is called Longleaf Pine, since its needles are longer than those of the Scrub Pine, *P. virginiana* (p. 39), associated with it. For the same reasons it is known in some localities as Longschat Pine. In Massachusetts it is Hard Pine; in Pennsylvania, Yellow Pine; in North Carolina and eastern Tennessee, Black Pine; and in New York, Black Norway Pine.

One favorable feature of the Pitch Pine that recommends it for reforestation is the fact that it is the most fire-resistant pine in the East, for already in its sapling stage it develops a heavy bark that enables it to withstand forest fires where other trees would succumb. Like the Jack Pine it thrives on poor soils.

Between the southernmost of the Pitch Pines and the path stands a feeble specimen of Western Yellow-Pine (p. 27), which species we have already noted across the path. Next we come to three Japanese Black-Pines (p. 28), also belonging to a group in Section 2. The first of these stands back from the path just beyond the lone Western Yellow-Pine and the others are the two larger trees next along the path. On the slope above the first two of these Japanese pines stands a large Austrian Pine (p. 31), and above this on the slope a smaller Japanese White-Pine (p. 15), with wide-spreading branches. Another specimen of this last species stands still higher on the crown of the knoll to the left and the other tree a little beyond it is a Scotch Pine (p. 33).

Returning now to the path, the bushy and spreading tree above the southernmost of the Japanese Black-Pines and a bit to the right is

Pinus virginiana, the Jersey or Scrub Pine

This pine, like the Pitch and Jack Pines, has relatively little ornamental value. It is a tree of poor sandy soil, ranging from Long Island south along the coast to Mississippi and north to Indiana and Ohio. On the coast it is usually a low shrubby tree of the poorest soils, but west of the mountains it appears in mixture with broad-leaved trees on the better sites and there attains a height of 100 feet. Usually it is only 30 or 40 feet tall and very frequently is scrubby. It is characterized by having needles in twos, more twisted and spread apart than in any other pine. Furthermore, the trees are generally laden with numerous persistent small cones. The wood of this species is of comparatively little value. A compensating feature of the trees, however, is their ability to grow on poor sites.

Nearly twenty different common names have been applied to this pine in various localities.

The Jersey Pine bears considerable resemblance to the Jack Pine (p. 24), which we shall see next. The two evergreens, one approximately behind the other just south of the southernmost Japanese Black-Pine are also Jersey Pines. Their twisted and moderately long needles distinguish them. Furthermore, the branchlets of Jersey Pine are glaucous, *i.e.*, they are covered with a bloom or whitish substance that rubs off, while those of *P Banksiana* are not glaucous. The remaining eight small trees here and beyond are Jack Pines.

We now come to a fine collection of Austrian Pines (p. 31), the same as those we have already observed across the path in Section 2. There are eight big specimens here, extending westward along the slope and with them are three Scotch Pines. One of these latter is the good-sized orange-barked tree that stands half way along the top of the slope and above the Austrian Pines. Farther along, behind the last of the Austrian Pines, is the second and somewhat stunted one. And a third Scotch Pine is the last tree with the orange-colored bark along the path next to the last of the Austrian Pines.

The next small tree just west of this last Scotch Pine as well as four other similar ones partly up the slope to the right are Pitch Pines (p. 36), which we should immediately recognize or at least suspect when we notice the needles in threes.

On the eastern slope of this knoll are several small trees with long needles in pairs. They are

Pinus resinosa, the Red or Norway Pine

This is regarded as one of the best of our native eastern pines for ornamental planting. In the Garden, however, it has been very unsuccessful, for the pine-shoot moth has caused considerable damage to it. Where this trouble is absent the Red Pine is very fine. It is very intolerant of shade and must not be overtopped.

The Red Pine is native from Newfoundland to Manitoba and south to Massachusetts, Pennsylvania, and Minnesota, attaining a height of 70 and even 100 feet. It is characterized principally by its rather long, slender and flexible needles in twos and its distinctly reddish bark. It resembles most closely the Austrian Pine except for the color of the bark and its more slender leaves. Furthermore, the sheath at the base of the needle clusters in the Red Pine is longer than in the Austrian.

In the Lake States this tree is called Hard Pine to distinguish it from the softer White Pine. In England it is known as Canadian Red-Pine for it is imported from the Canadian provinces. Norway Pine was applied by the early explorers who, in some inexplicable manner, mistook it for Norway Spruce.

The wood of Red Pine was extensively employed formerly, entering into a number of products. In this country and in England it was once popular as ship timber. The slender straight trunks were selected for masts or sawed for decking. White Pine probably surpassed it for masts and Live Oak from the South was the primary wood for hulls. Today, however, its decreased supply has given way to the yellow pine of the South. Large quantities, nevertheless, still enter the trade.

Let us now stand by the uppermost of those small Pitch Pines and turn our attention to the remaining trees on the western side of this knoll. The largest one nearest the top of the slope and the Museum as well is a Scotch Pine. West of it is a group of Jack Pines with smaller Korean Pines on the other side of them. The tree at the foot of the incline on the extreme left is another Scotch Pine. Just to the right of it are three trees in a row running from us. The first and nearest to us is

Pinus sylvestris var. **argentea,** the Silvery Scotch-Pine

This is a natural variation with silvery leaves, found in the Caucasus. The feature may not always be apparent as is the case very frequently with many similar varieties. We shall meet other specimens in the next Section.

The second tree in the row is a plain Scotch Pine and the third and younger one nearer the path is

Pinus koraiensis, the Korean Pine

Let us descend the slope to it.

The other five similar-looking trees in the corner of this Section, together with a sixth and smaller one along that next path running toward the Museum, are the same. The Korean Pine is an eastern Asiatic species occurring in Amurland, Manchuria, Korea, and Japan. It is a five-needle species and very much resembles the Swiss Stone-Pine (p. 13), sharing with that tree the three characteristics of dense brownish pubescence on young shoots, of wingless seeds and of indehiscent cones, that is, cones which do not open upon maturity but must decay or be forced open by man or beast to liberate the seeds. However, the leaves on the Korean Pine are stouter and the teeth on the margins more numerous and carried to the tips. Their cones, moreover, are larger.

The Korean Pine attains a height of 100 feet in its native home; the wood occurs in the trade. In pre-war days it was becoming a very valuable article of export to Chinese and other Asiatic and Australasian ports. The seeds are sometimes used as food.

We shall meet several more specimens, some larger, in this and the next Section.

The flat-topped, spreading, and peculiarly shaped pine of very open habit, west of the last Scotch Pine that we noted and behind the first two Korean Pines that we met, is

Pinus pungens, the Table-Mountain Pine

Another tree of this kind stands directly to the west with one other tree intervening. This tree is of comparatively little ornamental importance. It lives under a variety of names, including Southern Mountain, Poverty, Prickly, and Hickory Pine. It is native to the eastern United States in the Appalachian Mountains, from North Carolina to New Jersey and Pennsylvania. Its height varies usually from 20 to 40 feet and the flat nature as seen here is quite typical. It is of little economic value and consequently not very well known though the wood appears on the market, but is not distinguished from the yellow pine with which it is cut.

The Table-Mountain Pine has leaves in groups of two; their very stiff, stout and sharp-pointed nature distinguish the tree from other two-needle pines. Furthermore, the cones, which may remain on the trees for 15 or 20 years, are armed with distinct prickles on the scales. The cones appear in clusters of three to eight, not scattered.

The tree which stands between the two Table-Mountain Pines as well as 13 other similar ones scattered over the remaining portion of this Section, some of which we have already noted, we should recognize as the common Jack Pine (p. 24), by their cones and general appearance. On the eastern side of these Jack Pines the tree farthest up the slope is another Scotch Pine.

Now, to finish this Section, let us begin at the corner of the two paths just between the little Korean Pines we have already noted and the fine Blue Spruces on the opposite side. Proceeding along the path toward the Museum, the taller tree just beyond the last small Korean Pine we should recognize by its clumps of leaves on the trunk as a Pitch Pine (p. 36). Directly east of it toward the slope the tree with the softer-colored bluish-green leaves is an older Korean Pine. Along the path are scattered fourteen more young trees of this species. And still one more, an older specimen, is that very bushy-looking, stunted tree with rather striking bunches of needles that stands east of these younger ones with the Jack Pines for a background. The two remaining trees here are just to the right of this last Korean Pine and are Pitch Pines.

Section 4

The fourth and last section of the Pines lies directly east of Conservatory Range 1 (Map p. 7). We shall begin at the northwest corner and proceed along the gravel path that runs south between the Section and the flower beds on the east side of the Conservatory.

The first six trees on our left along the path we should recognize as Japanese Black-Pines (p. 28), for we have already encountered others like them in Sections 2 and 3. The fourth and sixth of these are set back from the path more than the others.

Behind the second and third of these Japanese pines stand two tall Austrian Pines (p. 31). Beyond the last of the Japanese pines along the path are three large Crimean Pines (p. 27), the first of which is set back near the top of the mound.

Beyond the ones along the path are three more small Austrian Pines, two of which are nearer the top of the knoll. Then comes another large one.

The three low bushy evergreens that hug the ground at the turn in the path are

Pinus montana var. **Mughus,** the Mugho or Knee Pine

This is one of the most extensively used evergreens for ornamental planting. Though it may become four or five feet tall after many years, it generally remains low and close to the ground. It consequently has a valuable place in foundation plantings and in other places where a truly dwarfed plant is desired. It is perfectly hardy and seems to withstand city conditions quite well. A very large group of Mugho Pines is located at the west end of the bridge that crosses the Bronx River some distance behind the Museum. In spring the new growth on these pines is very attractive. The many shoots are covered with a whitish resin and stand erect on the plants, like so many candles. The needles are in groups of two.

The Mugho is a natural variety of the Swiss Mountain-Pine and ranges at high altitudes in Europe from the eastern Alps to Bosnia.

Behind these three Mugho Pines is a small Austrian Pine, a bit to the right. A large one stands straight up the slope, and above it, near the top of the slope, is a fine Scotch Pine. The last is easily recognized by its orange-colored bark and general habit.

To the right are eleven small trees on the slope. They are all Korean Pines (p. 42), the same as those we met in Section 3.

The crown of the slope we are now on supports quite a selection of pine trees. We can best pick them out by first locating ourselves by the uppermost of the little Korean Pines on the south

FIGURE 7. Mugho Pines
Pinus montana var. *Mughus*

side of the large Scotch Pine. Having done so, let us first note the tallest and broadest tree in the group on top of this Section. It stands approximately in the center of the planting on top of the knoll and is a common White Pine (p. 17). Almost in a line with it and us is a smaller tree with its darker leaves in distinct tufts. To the right of this latter and about 15 feet in front of us, the nearest of all the trees, is a similar one. These two are Limber Pines. There are altogether thirteen specimens of this tree distributed over this area. We shall consider them more in detail a little later.

On the far side of the big center White Pine and in line with our station at the little Korean Pine are two more trees. The first of these is another Korean Pine and the second a Limber Pine. To the right of both of these is another isolated common White Pine.

If we step two paces to the right of the second of the two Limber Pines before us, we should notice a row of three trees extending from us. The first is a common White Pine and the other two are Limber Pines. The three small trees to the extreme right are all common White Pines.

Now we must step to the left of our original position until we come in line with a row of four low trees to the left of the big center White Pine. The big Scotch Pine is now behind us. The four trees in the row before us, with the exception of the second, are Korean Pines and the second one is another common White Pine.

Still more to the left and ahead of us are more Korean Pines. They are lighter-colored than the others about them. The darker eight include the more or less distinct group toward the end of of this planting. They are

Pinus flexilis, the Limber Pine

Not much is known concerning this tree as an ornamental in this section of the country. It is a native of western North America, ranging from Texas to Alberta and westward into California at altitudes up to 12,000 feet. It is particularly a Rocky Mountain tree. In its native range it may attain a height of 80

feet, though usually it is only about 50 feet tall. It is a hardy species of slow growth and frequently occurs as a stunted tree, at least, at the higher limits of its range. In some sections it forms extensive forests and is cut for lumber; elsewhere it occurs in mixture with other species.

Both the common and botanical names of this species have arisen from a remarkable flexibility of the wood, for a branch of the tree can be bent to any angle without fear of breakage.

The Limber Pine is a five-needle evergreen and is distinguished from all other five-needle pines, except *P. albicaulis* and *P. pumila,* by the fact that its needles are practically without teeth. This, however, can be determined only by the aid of a microscope, for a pine needle may appear perfectly toothless until examined under the lens. In fact, there are only five pines whose needles may be regarded as entire, that is, having no teeth. The two in addition to the three already noted are *P. aristata,* the Bristlecone Pine, and *P Balfouriana,* the Foxtail Pine. The Limber Pine is the only one of these five that is represented in the collection.

Pinus flexilis, like *P. Cembra* and *P. koraiensis,* has wingless seeds, but differs from those two in having dehiscent cones that open upon maturity and liberate the seeds. This character of wingless seeds occurs only in three other pines, which are absent from the collections. Lustrous yellow cones, when present, are a further distinguishing feature of the Limber Pine.

Beyond all the Limber Pines and at the northern end of this Section are two large dark-colored Austrian Pines, one of which is more to the right. A third stands along the edge of the slope on our right.

We shall now turn our attention to the remaining trees on the slope to the right. To do so we shall go down to the path, face the slope, and commence with the low evergreen to the extreme left. It is

Pinus sylvestris var. **Watereri,** Waterer Pine

This plant was secured from a nursery under this name. It may, however, be incorrect, for the Waterer Pine is usually of upright columnar habit.

Proceeding along the path we next pass a tree with reddish-orange scaly bark. It stands a slight distance up the slope and is a Silvery Scotch-Pine (p. 41). Above it up the slope stands a good-sized common White Pine.

Next, along and nearer the path, stands another White Pine. To the right of it is a row of three more Silvery Scotch-Pines extending up the slope.

Next and nearer the path, is another common White Pine. The very slender small tree some distance behind it with upward pointing branches is

Pinus sylvestris var. **fastigiata,** the Pyramidal Scotch-Pine

This is another horticultural variation of the Scotch Pine. It is quite distinctive and rather pleasing in shape when properly located.

The next very low evergreen along the path with tufted glaucous leaves we should recognize as the dwarf form of the Japanese White-Pine (p. 15). Behind it is another large native White Pine. The very nice low compact globular tree behind and almost concealed by this large White Pine is a Macedonian Pine (p. 14). Above it the broad short tree to the right is a Limber Pine (p. 46), and the one to the left of this is a common White Pine.

Let us now return to the path. First we pass another large White Pine. The next pyramidal compact tree that stands near the path is a Swiss Stone-Pine (p. 13). Behind it to the right and to the left are two large White Pines, and behind these the two big trees with drooping needles are Himalayan White-Pines (p. 16). These are two of the finest trees in the entire collection and can be fully appreciated only at close range.

Behind and between these two big Himalayan White-Pines is a Limber Pine and to the right and left a bit farther up the slope are two more native White Pines.

Back to the path, the broad bluish evergreen behind the concrete seat is a Macedonian Pine. Its top has been cut off. The next along the path is the same and behind these two the taller

FIGURE 8. Macedonian Pine, *P. Peuce,* right and left foreground; Himalayan White-Pine, *P. nepalensis,* center background; Eastern White-Pine, *P. Strobus,* above left-hand Macedonian Pine.

tapering tree is yet another; three Macedonian Pines in a triangle here. The two front ones are rather similar to the Swiss Stone-Pine just back to the left. But if we look carefully at the young branchlets near their tips we will see that those of the Stone-Pine are very distinctly hairy while those of the Macedonian Pines are smooth and yellowish. It is well to notice here that dust and dirt accumulates on these otherwise smooth surfaces and may appear as a fine hairiness. However, these three trees will very quickly show the difference between genuine hairiness and what may merely appear as such.

Farther along the path, we notice a large boulder half buried in the ground. By it stands another Himalayan White-Pine and two more trees of the same kind are in the nearby vicinity. One is the large tree farther up the slope and a bit to the right and the last one is farther along the path, betrayed by its long foliage. There is one more tree right here just before we get to this last Himalayan White-Pine. It stands at the same distance from the path and is a Korean Pine (p. 42). Moving on a bit, we come to an opening in the planting and the low dense evergreen half way up the slope is a Macedonian Pine.

Following the path now to the left, we pass four larger trees that we recognize as Austrian Pines.

The remaining four small evergreens near the last Austrian Pine are

Pinus edulis, the Nut or Piñon Pine

This tree so far is unimportant ornamentally in this section of the country. It is native to the Rocky Mountain regions at elevations up to 11,000 feet in New Mexico, Colorado, Utah, Arizona, and northern Mexico. The Nut Pine is normally of small stature, not more than 30 or 40 feet in height and its scraggly and stunted form on dry and gravelly uplands of the Southwest is one of the characteristic marks of that region.

The leaves on the Nut Pine vary in number, occurring singly or in threes, but usually paired. The wood is highly esteemed for fuel and railroad-ties, but otherwise has little value. The seeds,

however, give the Piñon Pine its local popularity in the Southwest, for they are a delicacy to the people and when roasted are much prized. The gathering of these so-called nuts constitutes quite a little industry in the region and furnishes occupation for many.

General Discussion

Now that we have completed our study of some of them individually, let us consider the pines as a whole.

All pines are evergreen. That is, though their needle-like leaves are shed and new ones appear each year, only a portion of their foliage is lost at any one time. Consequently, the trees as a whole are always green. There is no regular periodic shedding and renewal of the foliage all at one time, as in the deciduous broad-leaved trees.

The pines constitute the largest and most widely distributed group of conifers. They are found throughout the Northern Hemisphere only, from the Arctic Circle to Mexico and the West Indies, North Africa, and the Malayan Archipelago; in tropical and subtropical regions they are usually confined to the mountains.* Including all the varieties that occur as a result of this wide distribution and those that have arisen through garden practice, more than six hundred kinds of pines have been described.

According to one authority, who recognizes sixty-six distinct species scattered over the Northern Hemisphere, the distribution is as follows:

Eastern Hemisphere—23

1 exclusively African (Canary Islands)
2 exclusively European
2 common to Europe and northern Asia
4 about the Mediterranean Basin
14 exclusively Asiatic

Western Hemisphere—43

28 in western North America, of which 12 are confined to Mexico and Central America
15 in eastern North America, of which 2 are exclusively West Indian

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* Most plants, if they enjoy a wide geographical distribution from north to south and are normally inhabitants of temperate and northern climes, ascend to higher elevations in the southern limits of their range. This tends to lessen the contrast in temperature and other environmental factors

According to this tabulation there can be in the United States no more than twenty-nine different pines. Including several distinct varieties, we may safely say that there are about thirty-five kinds. As many different pines, therefore, are found in the continental United States as in the rest of the world. They are scattered from one end of the country to the other. As a survival from the first and most obvious classification of these trees that sprang up with the beginnings of lumbering in this country, the pines are still frequently classified as "hard" and "soft" pines. This distinction was originally based upon certain features of the wood and upon that basis it is often inaccurate. Certain so-called "hard" pines may be softer than certain so-called "soft" pines. These two groups, however, are recognized in further technical considerations where there is more accurate distinction.

Of the thirty-five native pines, twelve are spoken of as "soft"† and the other twenty-three as "hard."‡ In the eastern United States the common White Pine is the only truly "soft" pine. The remaining pines in this section of the country are twelve different "hard" species, namely, Pitch, Red, Jack, Table-Mountain, Jersey or Scrub, Longleaf, Shortleaf, Loblolly, Cuban, Pond, Spruce and Sand Pine. The last seven of these are typically southern trees and consequently cannot be represented in the Garden collections. The other five northern species are all in the Pinetum.

Of the western species, Sugar Pine and Western White-Pine are the most important of the soft pine group. Neither of these occurs in the Garden, but there are six other western species, namely, Digger, Western Yellow, Lodgepole, Jeffrey, Limber, and Piñon Pine.

The most popular and convenient manner in which the pines are frequently divided and most commonly thought of depends upon

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† These are White Pine (*P. Strobus*); Sugar Pine (*P. Lambertiana*); Western White Pine (*P. monticola*); Mexican White Pine (*P. strobiformis*); Limber Pine (*P. flexilis*); Whitebark Pine (*P. albicaulis*); Foxtail Pine (*P. Balfouriana*); Parry Pine (*P. quadrifolia*); Mexican Piñon (*P. cembroides*); Piñon (*P. edulis*); Singleleaf Piñon (*P. monophylla*); Bristlecone Pine (*P. aristata*).

‡ These are Longleaf Pine (*P. palustris*), Shortleaf Pine (*P. echinata*), Loblolly Pine (*P. Taeda*), Cuban Pine (*P. caribaea*), Norway Pine (*P. resinosa*), Western Yellow Pine (*P. ponderosa*), Chihuahua Pine (*P. chihuahuana*), Arizona Pine (*P. arizonica*), Pitch Pine (*P. rigida*), Pond Pine (*P. serotina*), Spruce Pine (*P. glabra*), Monterey Pine (*P. radiata*), Knobcone Pine (*P. attenuata*), Gray Pine (*Pinus Sabiniana*), Coulter Pine (*P. Coulteri*), Lodgepole Pine (*P. contorta*), Jack Pine (*P. Banksiana*), Scrub Pine (*P. virginiana*), Sand Pine (*P. clausa*), Table-Mountain Pine (*P. pungens*), California Swamp Pine (*P. muricata*), Torrey Pine (*P. Torreyana*).

the number of needles that occur together in a bundle or sheath. Altogether there are 27 different species and varieties of pine in the collections of the Pinetum and it will be well to list them here according to the number of their leaves.

Of 18 different known species with needles in 5's, seven are in the Garden, viz.:

P Cembra, Swiss Stone-Pine of Europe and Siberia
P. excelsa, Himalayan White-Pine of the Himalayas
P flexilis, Limber Pine of western North America
P. koraiensis, Korean Pine of northern Asia
P. parviflora, Japanese White-Pine of Japan
P. Peuce, Macedonian Pine of southeastern Europe
P. Strobus, Eastern White-Pine of eastern North America

Of 20 or 25 known species with needles in 3's, six are in the Garden, viz.:

P. Bungeana, White-Bark Pine of China
P. Sabiniana, Digger Pine of western United States
P. sinensis, China Pine of China
P. Jeffreyi, Jeffrey's Pine of western United States
P rigida, Pitch Pine of eastern North America
P. ponderosa, Western Yellow-Pine of western North America

Of 20 or 25 known species with needles in 2's, eight are in the Garden, viz.:

P. sinensis, China Pine of China
P. sylvestris, Scotch Pine of Europe and western Asia
P Thunbergii, Japanese Black-Pine of Japan
P. nigra, Austrian Pine of southern Europe
P virginiana, Jersey or Scrub Pine of eastern United States
P. pungens, Table-Mountain Pine of eastern United States
P. Banksiana, Jack Pine of eastern North America
P. densiflora, Japanese Red-Pine of Japan
P. resinosa, Red Pine of the United States

The other 6 pines not included here are varieties of these species.

Ornamentally some of the pines are distinctly valuable. As a whole, they are surpassed by the firs and spruces. They are, for the most part, trees; few are shrubby. Consequently, they serve for backgrounds or as individual specimens and do not as a rule fit into small plantings. For permanent and large settings they are especially fine, for they do not lose their beauty with age as do

many spruces and firs. On the contrary, they gain in character and picturesque appearance. A number of dwarf, pendulous, and varicolored varieties have been developed by nurserymen from several pines, particularly the common native White and Scotch. Interesting bushy freaks are produced from the Canary Pine, *P. canariensis,** and the Italian Stone-Pine, *P. Pinea,* by layering. In this manner, single leaves, as the primary needles of young seedlings, are produced instead of two in a sheath.

The pines are not suited to pruning. Their foliage is too open to permit such operations and attempts in that direction generally result only in malformation. If their shape is to be controlled at all, the center buds may be removed from such shoots as project beyond proper limits. This will not only hinder the further growth of such undesirable branches, but will tend to direct growth into a more compact form.

Pines, furthermore, are not adapted for hedges. Their growth is too open and coarse and pruning cannot be resorted to. In addition, they are not shade-enduring and would soon thin out in the interior if they could be trimmed into hedges. The White Pine and the Mugho Pine have, however, served as hedges with some success.

The pines, as a rule, are less exacting in their soil requirements than are many other evergreens. They are essentially inhabitants of poor sandy soils and dry situations. Their stout deep root system enables them to seek scanty water supplies where other trees find it difficult. They respond best to medium conditions. Their heavy tap root needs a deep mellow well-drained sandy loam soil. Compact clay soils are inimical; shallow soils cause spindly growth. Wet lowland soils are not to their liking. They prefer well-drained or even dry hilltops to low bottomlands. Generally, they withstand southern exposures better than spruces. Too rich condition is apt to induce rank luxuriant growth that leads to poor form.

The White Pine lends itself most readily to a variety of soils, including clay. The Red Pine of the North and the Loblolly and the Longleaf of the South exhibit departures from the general

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* Specimens of this species will be found in Conservatory Range No. 2.

aversion of pines toward excessive moisture. The former will thrive in a swamp as well as on upland gravel and the latter makes magnificent trees in the southern swamplands. The Pitch Pine, too, is at home both in wet and dry places. The Scrub Pine of the West, *Pinus contorta,* as well as the Cuban Pine, *P. caribaea,* and the Pond Pine, *P. serotina,* of the South, likewise seem indifferent to water conditions about their roots.

It must be borne in mind when combining pines with other trees in any setting that they are essentially light-demanding trees. Consequently, they will not endure overtopping or crowding unless by vigorous height growth they can extend above more shade-enduring competitors. If planted thickly in pure stands they will either soon lose their lower limbs and maintain a marked uniformity or the more vigorous trees will crowd out the others. The five-needle white pines, particularly *Pinus Strobus,* are the most tolerant and the dwarf Mugho Pine is markedly so too.

In respect to rapidity of height growth the leaders are the common White Pine, *P Strobus,* Cuban, *P caribaea,* Scotch, *P. sylvestris,* and Austrian Pine, *P. nigra.* Under favorable conditions these will produce annual shoots of from one to two feet for a number of years. Pines of high altitude, on the other hand, are slow growers; *e.g.,* Swiss Stone-Pine, *P Cembra.*

In the matter of maximum height growth the common White Pine again is a leader. Before the days of excessive lumbering many of these trees exceeded 150 feet in height. This height is exceeded among the pines only by that of the very closely related western Sugar Pines and Western Yellow-Pines, which may become over 200 feet tall. Most others as a rule remain under 100 feet and the big majority seldom become over fifty feet tall.

While the pines as a whole may be inferior to the firs and spruces for ornamental purposes, they are unsurpassed as a group in the lumber world. No other trees of the temperate zone have contributed so much to the development of civilization in modern times as they. The common White Pine has long been regarded as the American wood *par excellence.* Its rapidity and quantity of production, its adaptability to variations of climate and soil, and the excellence of its wood have placed it in the lead. Reduced

supplies, however, have curtailed its use. In 1850 White Pine surpassed all other woods in production. Today two-thirds of the lumber cut in this country consists of the four southern yellow pines, Longleaf, *P. palustris;* Shortleaf, *P. echinata;* Loblolly, *P. Taeda;* and Cuban, *P caribaea.* Other lesser kinds also contribute to this production.

In the West, the most important are the Western White, *Pinus monticola;* Sugar, *P. Lambertiana;* and the Western Yellow, *P. ponderosa.* In Mexico, the Mexican White-Pine, *P Ayacahuite,* replaces our white pines, and the Arizona Pine, *P. arizonica,* and the Montezuma Pine, *P. Montezumae,* are the important yellow pines.

In northern and central Europe, the Scotch Pine is the important tree, furnishing the bulk of supplies. In southern Europe, the Austrian Pine, along with its several geographical variations, supersedes the Scotch Pine.

In Japan and northern China, the Japanese Red- and Black-Pines are the important timber species. In the Himalayas the Himalayan White-Pine and the Long-Leaved Indian-Pine, *P. longifolia,* are the leaders.

And in the Philippines, the Khasia Pine, *P. insularis,** forms important mountain forests.

In addition to its high lumber value the Longleaf Pine possesses further value in its productions of naval stores. The turpentine, tar, and pitch that is annually derived from its resinous contents constitute an important source of additional revenue for the Southern States. Pine wool is made from the leaves of this and other species; essential oils are distilled from leaves and young shoots and used medicinally and the seeds of the western nut pines furnish food.

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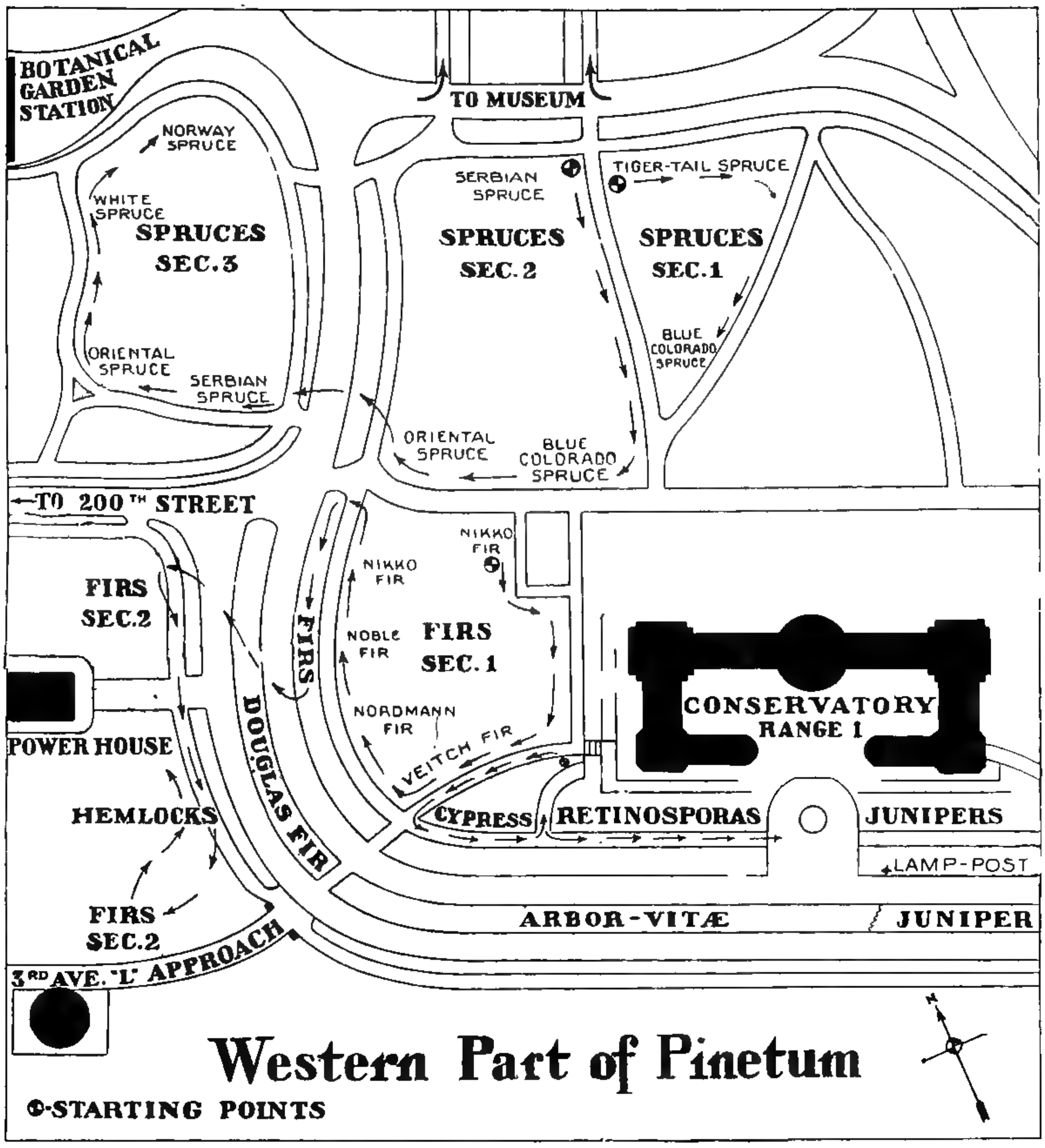
* Specimens of this may be found in Conservatory Range No. 2.


BOTANICAL GARDEN STATION
TO MUSEUM
NORWAY SPRUCE
WHITE SPRUCE
SPRUCES SEC.3
ORIENTAL SPRUCE
SERBIAN SPRUCE
SERBIAN SPRUCE
SPRUCES SEC.2
TIGER-TAIL SPRUCE
SPRUCES SEC.1
BLUE COLORADO SPRUCE
ORIENTAL SPRUCE
BLUE COLORADO SPRUCE
TO 200TH STREET
FIRS SEC.2
NIKKO FIR
NIKKO FIR
NOBLE FIR
FIRS SEC.1
NORDMANN FIR
VEITCH FIR
FIRS
DOUGLAS FIR
CONSERVATORY RANGE 1
POWER HOUSE
HEMLOCKS
CYPRESS
RETINOSPORAS
JUNIPERS
LAMP-POST
FIRS SEC.2
ARBOR-VITÆ
JUNIPER
3RD AVE. "L" APPROACH
Western Part of Pinetum
⊕-STARTING POINTS

PART 3—SPRUCES

THE PRINCIPAL SOURCE OF PAPER-PULP

VALUABLE ORNAMENTAL EVERGREENS WITH HEAVY FOLIAGE

Section 1

The collection of Spruces lies north of Conservatory Range I and west of the Pines. Section 1 is the sloping triangular area whose base lies along the south side of the cross road in front of the Museum (Map p. 57). In this Section are only two kinds of evergreens, arranged in four groups. All the evergreens in each of the basal corners near the road as well as those in a scattered group half way up the slope along the eastern bounding path are

Picea polita, the Tiger-tail Spruce

This is one of the most distinct of spruces. First contact with it cannot fail to impress one indelibly by the hostile rigidity of its needles. No other spruce resembles it in this respect. Its dark reddish-brown winter buds also are very conspicuous. It is very ornamental, quite hardy, and should prove excellent when young as a protective hedge.

The Tiger-tail Spruce is native to Japan, where it is the tallest of several spruces, attaining a height of 130 feet. Usually, however, it is only about half that size. It is generally found there on volcanic soils of recent formation and even on old lava flows. Under cultivation it succeeds in moist loamy and peaty soils but growth is slow. In Japan it is much cultivated for decorative purposes especially about temples. The wood is used to some extent for general construction purposes.

To the Japanese this tree is known as *Bara-momi, Hari-momi* and *Toranoo-momi.* The first name in each instance has reference to the sharp nature of the stout leaves. It is also known as White Fir, *Siro-momi,* in Japan. The Chinese know it merely as Common or Native Fir, *Jo-bi-sjo.*

All the trees in the apex of this Section nearer the Conservatory are

Picea pungens var. **glauca,** the Colorado Blue-Spruce, and **Picea pungens** var. **Kosteri,** Koster's Blue-Spruce

The Colorado Blue-Spruce is probably the best known ornamental evergreen tree, for it is very extensively used. In fact, its unusual beauty has become almost common during recent years through overuse. It is very frequently set in most inappropriate places that fail to show the tree's true value. It is unusually hardy and generally a safe tree to plant.

A careful observer should notice in any number of these trees and particularly in those about us now that there is variation in the shades of color. During the winter the differences are scarcely apparent but in spring and summer they are very striking. The typical Colorado Spruce, several trees of which stand directly across the path to the west in the next Section, has green foliage. But this tree, as we shall also see in the Douglas Fir, seldom is typically green. It shows a variety of bluish tints and the Colorado Blue-Spruces represent the extremes in this variation. Many years ago an unusually blue variety appeared among some trees that were imported by Koster's Nursery in Holland from this country. It was propagated there by grafting in order to perpetuate its color and all the trees that have since been secured by grafting from that original stock are known as Koster's Blue-Spruces. They are the most beautiful of the varieties. It should be understood, however, that all the blue spruces represent merely natural wild differences in degree of color and that one extreme variety has been perpetuated through grafting in the Koster's variety. All the other varieties may arise from seed.

While the blue spruces are magnificent for the first twenty years of their life they later tend to lose their lower limbs. This is especially true of the grafted forms. A side twig is usually employed for grafting and it has been claimed that the side of the mature tree which corresponds to the lower side of the original slip will first tend to show defects in later years.

The eight trees which are nearest the apex of this Section are Koster's Blue-Spruces. Those behind them are Colorado Blue-Spruces.

Section 2

Section 2 of the Spruces is the large and for the most part unplanted area directly west of Section 1 (Map p. 57). Beginning at the northeast corner near the fountain we find a group of small trees. They are

Picea Omorika, the Serbian Spruce

There is a group of four taller trees of this kind on the other side of the road. They stand at the foot of the right hand drive leading up to the Museum and on its eastern side. It might be well to step over there to see these larger trees also.

This is regarded as one of the best spruces for ornamental planting in the northeastern states. It assumes under cultivation a narrow pyramidal habit when young and is very hardy. It may be used as far north as New England and southern Ontario. It is, however, slow of growth. Furthermore, it thrives on limestone soil, which is a departure from the general rule among conifers. Moreover, it seems to endure a hot dry soil and impure atmosphere.

The Serbian Spruce has a very restricted natural range. It is found only in the valleys of the river Drina in southeastern Europe, where it occurs at elevations of 2,000 to 4,000 feet. It may attain a height of 100 feet there.

In the case of the pines, we found such very distinctive features as a certain number of needles in a sheath. In the spruces, however, no such simple distinctions occur. To identify them we must carry clear-cut impressions of the foliage and it is only by repeated comparisons that we can hope ultimately to be able to separate these trees. The Serbian Spruce, though it may not appear so at first, is one of the most distinctive. Its needles are flat and do not project from all sides of the twig but are arranged more or less in a horizontal plane and point forward. Furthermore, the branches are quite short in proportion to the height of the trees, thus giving a spire-like habit. The lower branches tend to curve up at their tips in older trees, and the small branchlets are hairy.

Let us now go south along the ascending path on which we started. Near the top of the incline we come to a fine collection of spruces that stand just across the path from the Colorado Blue and Koster's Blue-Spruces in Section 1. The first ten trees on our right, some of which stand behind others, are

Picea pungens, the Colorado Spruce

This is the tree of which the beautiful blue forms that we considered on the other side of the path are variations. This green form is more or less rare, for the great majority of these trees show some degree of blueness.

This tree, too, is very fine for decorative purposes, but has the same failing as the blue forms, losing its lower limbs in later years. With its numerous color gradations it occurs wild in New Mexico, Colorado, Utah, and Wyoming, at elevations ranging from 6,000 to 10,000 feet. It may attain a height there of 150 feet. In addition to its names of Colorado and Colorado Blue-Spruce it is also known as Parry's Spruce, Prickly Spruce, White Spruce, Silver Spruce, and locally merely as Spruce or Balsam.

Next to its distinctive color in certain individuals the most characteristic feature about this tree is the general character of the foliage. The needles are relatively long, stiff-pointed, and project forward and outward from all sides of the twigs. The main branches, furthermore, are quite horizontal and occur in whorls.

The soft weak wood of this tree has little commercial value and is used only locally.

The next seven bluish trees are all Colorado Blue-Spruces.

Beyond them and near the path is another blue but very low nearly prostrate evergreen. It is

Picea pungens var. **glauca pendula,** Weeping Colorado Blue-Spruce

This is merely a pendulous form of the blue varieties which originated in Holland. Another and bigger specimen of this form stands propped up between the road and path near the north end of Section 1 of the spruces.

All the remaining trees with one exception that fill the southeast corner of this Section are Colorado Blue- and Koster's Blue-Spruces. The one exception is a plain Colorado Spruce which stands behind the first Colorado Blue-Spruce next to the low pendulous form along the path. We shall not attempt to separate the others, but shall proceed to the next path and then turn right.

All the blue spruces are now on our right once more as we go westward. Beyond them along this new path are six more new trees. They stand opposite the first small garden with a low wooden fence around it on our left. They are smaller trees, not so dense, and their foliage tends to droop. They are

Picea Engelmannii, Engelmann Spruce

This tree does not thrive so well here as its very close natural associate, the Colorado Spruce. The causes are difficult to determine exactly. They undoubtedly include such factors as polluted atmosphere, short winters, curtailed dormant season, too warm summers, and improper soil conditions with respect to drainage and nutrition. In other sections of the Northeast where the winters are severe the Engelmann Spruce becomes a handsome tree of pyramidal habit.

The native home of this tree is at elevations ranging from 3,000 feet in the Rocky Mountains of Alberta and British Columbia up to 11,500 feet in Arizona and New Mexico. It extends westward to the Cascades of Washington and Oregon, often forming pure forests.

Five of these eight trees are bluish varieties known as *Picea Engelmannii* var. *glauca.* At the proper season they are distinguishable by the color of their foliage.

The remaining thirty-one trees in this Section that stand ahead of us and extend around the next turn to the right include fifteen of the green type and eleven of the blue type of Colorado Spruce. We shall not attempt to separate them all. The first two, close together, that stand very near the path came from a nursery as Compact Colorado Blue-Spruce, *Picea pungens* var. *glauca compacta.*

Mixed in with these Blue Spruces near the next bend are six trees of distinctly different foliage. Two of them stand just inside the low railing. Their needles, which are very much shorter than those of the Colorado Blue-Spruce, make the branches considerably more delicate looking. These trees are

Picea orientalis, the Oriental Spruce

This is one of the most attractive of all the spruces because of its dark-green short needles. Its cones are beautifully purple when young, later turning brown.

The Oriental Spruce is native in the mountain ranges of Asia Minor, Armenia, and the Caucasus, at altitudes varying from 2,500 to 7,000 feet. There it may attain a height of 100 feet and more.

In its native region the wood of this tree takes the place of that used elsewhere in Europe from Norway Spruce. Both are commonly used abroad for Christmas trees.

Section 3

This third and last Section of Spruces lies between the railroad tracks and the drive on the west side of the Garden and between the railroad station and the entrance into the Garden south of it at 200th Street (Map p. 57). We shall begin at the south end of the Section. If we have just completed Section 2, we need but cross the road and go down the gravel path on the other side flanked by bushes on both sides. A few steps in we meet the spruces again on the right. The first two evergreens are

Picea Maximowiczii, Maximowicz's or Japanese Bush-Spruce

This is a relatively rare kind of spruce, for even in Japan, where it is native, it grows only in remote mountainous sections. Unlike the Japanese Black-, Red-, and White-Pines, this spruce is not so commonly found about gardens and temples in Japan. To the Japanese it is known as *Hime-bara-momi, i.e.,* Daughter or Small *Bara-momi,* which, we will recall, is the vernacular for the Tiger-tail Spruce. This derivation of the name has arisen from the similarity of adult trees of these two species. As its name implies, this one is generally of low stature, though it may attain a height of 80 or even 100 feet.

It is difficult to mention any particularly distinguishing feature of this spruce. Perhaps most characteristic of it are its short leaves, which point out on all sides of the shoots, and the very resinous buds. The leaves, moreover, are quadrangular and rather pungent and the branchlets are not hairy.

The next four larger evergreens are Serbian Spruces (p. 60).

Of the next four small trees beyond these taller Serbian Spruces, one is

Picea jezoensis, the Yezo or Hondo Spruce

It is the inner tree in the second row of two trees.

This species has the widest distribution of any spruce in north-eastern Asia and Japan, where it attains a height of 100 or 150 feet and is the only flat-leaved spruce of that region. From other flat- or compressed-leaved spruces, it may be distinguished by the pale shoots and dark-green leaves, which are crowded on the upper side of the shoots, and bluish or silvery-white on the lower surface. The wood of this species is of good quality and, since the trees are plentiful in Japan, as a source of timber the Yezo is by far the most valuable of the Japanese spruces.

Yezo Spruce is rare in cultivation in this country and does not grow well in the eastern United States. It frequently suffers from late frosts owing to its early leafing.

The other three small trees are Norway Spruces. We shall consider this kind later when we meet larger trees.

The next two trees nearest the path are Oriental Spruces (p. 63). Behind them stand three other spruces. The single one directly in back is

Picea mariana var. **Doumetii,** Doumet's Spruce

This is regarded as one of the most ornamental garden forms of the native Black Spruce, which species is not at present represented in the Garden. In its typical growth Doumet's Spruce is featured by ascending crowded branches forming a dense conical pyramid.

The two other spruces behind this last one are Serbian Spruces.

Next to the Oriental Spruces along the path is

Picea bicolor, Alcock's Spruce

This species, a native of Japan, is rare in cultivation and even in its homeland it is not common. To the Japanese it is known as *Ira-momi.* Whitish lines on both upper and lower surfaces of the leaves constitute the principal characteristic.

The next and last tree along the path right here is the same as those which stand in a group farther along the path to the right. They are

Picea canadensis, the White Spruce

This is one of the native spruces of the eastern United States with a transcontinental distribution from Labrador to Alaska and south to Montana, Minnesota, and New York. It is essentially a northern tree, reaching to within twenty miles of the Arctic Ocean. It is of more economic importance in Canada than in this country because of its abundance there. Some trees attain a height of 100 feet. In New England it is extensively used for paper pulp manufacture.

The White Spruce is characterized by curved needles with pointed hardened tips of a bluish-green color, by reddish or yellowish flowers, and by shining light-brown cones. Moreover, the needles stand out from all sides of the twigs in very regular pattern.

The foliage of the White Spruce, when bruised, has a rank odor. This feature has led to some of its common names, among which are Single, Bog, Skunk, Cat, and Double Spruce.

This spruce makes a handsome ornamental evergreen in cold moist regions, but does not thrive well where summers are warm and dry.

On the eastern side of these White Spruces are two other different ones. The smaller one nearer the Museum is probably *P. Abies* var. *Gregoryana* and the other one *P. Abies* var. *compacta.*

The remaining evergreens in this Section we see in a group just ahead toward the Museum. A weeping beech tree stands near them. The most westerly of the evergreens, a small dense globular plant, is a White Spruce.

The five taller trees in the background whose needles do not project below the branchlets are

Picea Abies or **P. excelsa,** Norway Spruce

This is probably the best-known foreign evergreen that we have. It is very extensively planted in this part of the country and large veteran trees are not uncommon. Their principal distinguishing feature is the pronounced drooping habit of the countless evergreen branchlets that hang from the rigid boughs. This feature is just barely noticeable in trees before us. The Norway Spruce is one of the best conifers for shelters and windbreaks.

The Norway Spruce is native to most of the mountainous parts of central and northern Europe, east to the Ural Mountains. Though not wild in Great Britain, it has been cultivated there for four centuries. On the continent it attains a height of 100 and sometimes of 150 feet. Its wood is highly valued and extensively used in many wood-using industries. Burgundy pitch is the purified resin extracted from these trees. It is used in Europe in medicine for plasters and in the composition of varnish. Spruce beer, another by-product, is made from an essence of young shoots and leaves of Norway Spruces. The majority of Christmas trees in Europe and some in this country are this species.

A great many garden forms have been developed from the Norway Spruce, some of which we shall see presently.

We shall now proceed eastward along the south side of this group. The two outer small sickly trees are

Picea canadensis var. **coerulea,** the Blue White-Spruce

This is a variety of our native White Spruce with extremely glaucous foliage.

The two tall trees with yellowish and somewhat drooping foliage next to the Norway Spruces are

Picea Abies var. **finedonensis,** the Finedon Spruce

This variety is strikingly pale yellowish in spring, later becoming green.

The two small dense evergreens in front of these last are

Picea Schrenkiana, Schrenk's Spruce

This spruce comes from central Asia, where it forms large forests up to 10,000 feet elevation in Russian Turkestan. It is not well known in cultivation.

The taller tree with sloppy hanging branches nearby is

Picea Abies var. **pendula,** the Weeping Norway-Spruce

On the east side of this is a narrow opening. The outermost broad tree on the right-hand side as we enter into the group is an undetermined variety of spruce.

Behind it is another Weeping Norway-Spruce and a similar one stands on the left. The next tall pendulous tree on the right is

Picea Abies var. **inversa**

This variety is almost identical with the Weeping Norway-Spruce but the branches are said to be denser and more closely appressed to the stem. Two other larger trees of this variety stand to our left and set back from the opening we are in. Their odd shape betrays them.

The more normal open-foliaged tree on the left side of the opening is

Picea Abies var. **pyramidalis,** Pyramidal Norway-Spruce

The very large and innermost tree in this opening which stands on the right with hanging branchlets is

Picea Abies var. **Cranstonii**

This tree was received over a quarter century ago under this name, which does not appear to be recognized at present. The long pendulous branchlets, however, seem quite distinctive.

As we regard this tree from its western side the next equally tall tree to the right is a Norway Spruce, as is the tall one behind and between these two. The tree to the right of the first of these two is

Picea Abies var. **Barryi,** Barry Spruce

This tree received under this name is distinguished from others with difficulty. The four smaller trees closely set together on the west side of this Barry's Spruce are

Picea Abies var. **rubra,** Red Norway-Spruce

This name, too, is not recognized and so no information can be given concerning this tree.

Let us now go outside the group at this point. The very small compact evergreen with bristly foliage is

Picea Maxwellii, Maxwell's Spruce

This is a very dwarf compact variety with short stiff needles.

Behind it are the Red Norway-Spruces and next, to the right, is an unidentified one. East of this one is a larger Blue White-Spruce, behind which is the Barry's Spruce we have already noted.

The remaining large trees to the right are *Picea Abies* and its variety *aurea.* The latter have very yellow foliage in spring. There is one more Maxwell's Spruce and the taller though small dense evergreen to the right of it is

Picea Abies var. **Gregoryana,** Gregory Spruce

This variety is similar to the Maxwell Spruce, but the branches are slightly hairy.

General Discussion

The spruces, in the same sense as the pines, are all evergreens. There are thirty-eight different kinds in the colder and temperate climates of the Northern Hemisphere from the Arctic Circle to the high mountains of the temperate zone. These trees are distributed in the following manner:

Eastern Hemisphere—31	*Western Hemisphere—7*
28 exclusively Asiatic, of which 18 are confined to China alone	3 eastern North-American
	4 western North-American
2 exclusively European	
1 European and Asiatic	

In the United States there are only seven native spruces, three in the East and four in the West. The three eastern ones are the White, Black, and Red Spruces, *Picea canadensis, P. rubra,* and *P. mariana* respectively. The western ones are the Colorado, Engelmann's, the Weeping and the Sitka Spruces, *Picea pungens, P. Engelmannii, P. Breweriana,* and *P. sitchensis,* respectively.

The pines, as we have seen, may conveniently be divided into three classes according to the number of needles in each cluster. In the spruces, however, the needles occur singly in a spiral arrangement on the twigs. But three groups may be distinguished according to the shape of these leaves.

FIGURE 9. Black Spruce
Picea mariana

Of six known species with flat leaves having whitish bands on the upper side, which, however, face downward because of a twist in the leaf stalk, two are in the Garden, *viz.*:

P Omorika, the Serbian Spruce of southeastern Europe
P jezoensis, the Yezo or Hondo Spruce of Manchuria and Japan.

Of five or six species with four-angled and four-sided leaves having whitish lines conspicuous on two sides and inconspicuous on the other two, two are in the Garden, *viz.*:

P. Engelmannii, Engelmann Spruce of the western United States.
P. pungens, Colorado Spruce of the western United States

Of about eighteen species with four-angled four-sided needles equally marked on all four sides, seven are in the Garden:

P. Schrenkiana, Schrenk Spruce of Central Asia
P. Maximowiczii, Japanese Bush-Spruce of Japan
P. polita, Tiger-tail Spruce of Japan
P. Abies, Norway Spruce of Europe
P. orientalis, Oriental Spruce of Asia Minor
P. bicolor, Alcock Spruce of Japan
P. canadensis, White Spruce of eastern North America.

It would be very unusual for a pine and spruce to be confused, for the former always has its needles in clusters and the latter never. Spruces, however, may be confused with firs, which we shall see next. But the spruce needles are borne on persistent stalks which make a twig rough after the leaves have fallen but on the firs smooth round scars are left.

The spruces thrive best in moderately moist sandy loam but will grow in almost any kind of soil provided it contains sufficient moisture. They are somewhat more exacting in soil requirements than the pines, for they endure neither wet nor dry conditions. Northern slopes are well suited to them and they endure shade better than most other conifers, surpassing the pines in this respect. While the pines generally have a deep taproot and require deep soil, the spruces spread their roots more horizontally. They will grow, consequently, in shallow soil and are easily transplanted even as large trees. For the same reason they are easily wind-blown.

Ornamentally, the spruces rank very high, possibly exceeding the pines in some respects. They are more symmetrical and compact during youth but tend to lose their shape with age. There is considerable variety in their forms, ranging from the stiff Colorado Spruces through the delicate-foliaged Oriental Spruce to the pendulous Brewer's Weeping Spruce.

Commercially, the spruces are less important than the pines, so far as lumber is concerned. For paper pulp, however, especially in Canada and the northeastern states, they have long been regarded as the best source and great forests have gone into paper manufacture.

PART 4—FIRS

SOURCES OF BALSAM AND HANDSOME ORNAMENTAL TREES

Section 1

The collection of Firs lies west of Conservatory Range 1. Section 1 is directly across the path from the flower beds on that side of the Conservatory (Map p. 57). We shall begin at the northeast corner of this Section directly across the path from Section 2 of the Spruces and on the west side of two small flower gardens that have been cut out of this corner. Proceeding south the first thirty-one trees are

Abies homolepis, the Nikko Fir, and
Abies homolepis var. **umbellata**

The Nikko Fir has proved to be one of the most satisfactory ornamental firs for planting in the eastern states. Its principal distinguishing feature is the presence of deep regular grooves on the under side of the branchlets, particularly on two-year-old ones. The needles are rather firm and rigid though not prickly and form a distinct V-shaped trough along the upper side of the branchlet. The buds, furthermore, are resinous and very distinctive.

This is the common fir of Japan, where it attains a height of 125 feet at elevations between 2,500 and 5,000 feet. It is there known as *Dake-momi.* Its commercial use as a lumber tree in Japan is precluded generally by its relative inaccessibility. Though it may attain a greater height, it is seldom over 80 or 90 feet. A very prominent gross feature is that the upper branches grow longer than the lower ones. This is apparent in some of the trees before us.

The Nikko Fir has purple cones whereas the variety *umbellata* has cones that are green before maturity. Other distinctions are so minute and variable that we shall not attempt to separate the two forms here. The variety is also a native of Japan.

All the remaining trees along the eastern side of the Section and

twenty-five smaller ones in two rows at the southern end extending westward down the slope are

Abies Veitchii, Veitch's Fir

An additional tree of this kind is mixed in with the Nikko Firs. It stands at the western side of the group and just north of the last two Nikko Firs.

From the Nikko Fir this new kind may be distinguished by its shorter prominent whitish leaves and by its more slender shoots, which are pubescent. The small resinous purplish buds, too, are quite distinctive.

Veitch's Fir is the smallest of the Japanese firs, though it may attain a height of 80 and even 100 feet. It is typically alpine. rarely descending below 3,000 feet. Its wood is of no particular value in Japan, but in this country the species ranks as an ornamental tree next to the Nikko Fir among the Asiatic species. In Japan it is known as *Shirabiso, Shirabe-momi,* and *Shira-tsuga.*

In the two parallel rows of trees containing the twenty-five Veitch's Firs along the flower bed at the south end of this Section, there are actually twenty-eight trees. The sixth in the inner row proceeding down the slope is noticeably different from the surrounding Veitch Firs, particularly in its branches and buds. We should recognize it as Nikko Fir. The flat-topped and tallest tree in the two rows that stands next to the last in the outside row going down the slope is

Abies Momi or **A. firma,** the Momi Fir

This is one of the most distinct of firs and can scarcely fail to impress one by its very broad, long, light-colored, almost yellow-green needles. They stand out very rigidly in a single plane from two sides of the branchlets in the manner of the teeth of a comb. Each leaf generally bears two teeth at the end; and the shoots are grooved.

This is the only fir known from southern Japan, where it is regarded as the largest and handsomest of the genus. It attains heights up to 150 feet and ascends to 7,000 feet elevation. It is much cultivated in temple grounds and parks in Japan. The soft,

straight-grained and easily worked wood is used for building purposes and cheap packing cases, but is not greatly valued. Most of the boxes in which Japanese lily bulbs are packed for export are made of this wood as well as much of the paper pulp of Japan.

Though the Momi Fir is a thing of beauty in Japan, it does not do so well in this country, for it is not quite so hardy as some other species.

The well-developed tree with longer needles standing at the end of the inner row is

Abies Nordmanniana, Nordmann's Fir

This tree is regarded, along with the Nikko Fir, as one of the most desirable of foreign firs for ornamental planting in this part of the country.

It is native to the Caucasus, Asia Minor, and Greece and attains a height of 150 feet in the mountains around the Black Sea. Some commercial importance is attached to the tree there. It is readily distinguished by its long narrow leaves with two whitish lines below and by its scattered hairs on the young shoots. The leaves, furthermore, are arranged in a characteristic horizontally forward-pointing manner.

Near this Nordmann's Fir, the tree close to the path at its bend and a few feet beyond the end of the flower bed is

Abies cilicica, the Cilician Fir

This species resembles the last in the arrangement of the foliage but the leaves are less crowded on the shoot, are narrower and are more or less pointed at the apex. We shall meet a better specimen later. The buds, moreover, are rough with the prominent tips of the scales.

The Cilician Fir hails from about the same regions as the Nordmann's. It is native of Asia Minor and northern Syria, occurring on Mount Lebanon and the Antitaurus in association with the famous Cedars of Lebanon. In this range it attains a height of 100 feet.

Now we shall work our way toward the Museum along the western side of this Section. The flat-topped tree that stands a few feet directly north of that first Nordmann's Fir is another Momi Fir. West of it and ahead of us, are seven more Nordmann's Firs. The finest of these is nearest the path and Museum. Directly east of it are two trees with wide-spreading horizontal branches. The one nearest the road we should identify as another Momi Fir and the other very similar to it in foliage as well as form is

Abies homolepis var. **Tomomi,** the Tonomi Fir

Another specimen of this tree stands in the open about half way up the slope toward the Conservatory. As already mentioned, the foliage of these two trees is somewhat like that of the Momi Fir, but if we inspect the twigs we find them conspicuously grooved, indicating the affinity with the Nikko Fir. It is characterized by shorter leaves, a more sparingly branched form, and occurs wild in Japan.

We now come to a number of smaller trees. Two of them are near the path. The first of these is another Cilician Fir and the second poorer-shaped tree is a Greek Fir, which we shall soon consider. Directly toward the Conservatory from this last is another Greek Fir and the surrounding six small trees including four we have passed are

Abies nobilis, the Noble Fir

The last of these is the low flat-topped one about four feet high to our left.

The Noble Fir is one of the massive species of the Pacific Northwest, where it is native on the Cascade and Coast ranges from Washington to northern California. It frequently exceeds a height of 250 feet in this range, but under cultivation in the East is usually of a dense bushy form. This species is distinguished from other firs except *Abies magnifica*, another great species of the West but absent from the collection here, by the crowded leaves on the upper side of the branchlets, having their bases flattened against it.

The nine small evergreens that are spread out east of the Noble Firs and toward the Museum are

Abies cephalonica, the Greek Fir

The Greek Fir is a native of the higher mountains of Greece and the Isle of Cephalonia once boasted a forest of this species 12 to 15 miles in length and 36 miles around. This fir is distinguished from others by its departure from a general feature of the firs. Its foliage is spruce-like, that is, the needles are radially arranged on the twigs growing in all directions rather than in certain planes as with other firs. Moreover, the leaves have spiny tips.

Now we come to another group of taller and more developed trees. The first one along the path beyond the Noble Firs is a Momi Fir (p. 73), and the second of similar size and shape is another Veitch Fir. The four large and similarly shaped and broader trees to the right and beyond are Nikko Firs (p. 72). Beyond the one of these along the path the tree with somewhat drooping branches is a Cilician Fir. To the right of it are two more of similar size. The remaining eight trees along the path, the first of which is the poorest specimen, are all Nikko Firs, with possibly one specimen of the variety *umbellata*. All the remaining trees in this Section east of these Nikko Firs are

Abies concolor, the White Fir

The White Fir is the most successful of our native firs as an ornamental tree in the Eastern States. It withstands heat and drought well and generally forms a very fine tree. It is fairly tolerant of shade.

In the West it is one of the largest conifers, attaining, at times, a height of 250 feet. In the Rockies it is a tree of ordinary size. The weak brittle wood is generally unsuitable for lumber, but well adapted for butter- or lard-box material, for it is free from objectionable odors.

This fir is readily distinguished by its foliage. The leaves are quite long, flat, glaucous, and curve outward and upward. The bark on the trunk usually shows numerous balsam blisters whose contents are employed as Canada Balsam.

A few more firs are located between the path and road on the west side of this Section. Proceeding south along the path and beginning opposite the corner of the Section we have just completed, the first two evergreens with a yellow birch between them are Nikko Firs.

The next three beyond the intervening white poplar are Veitch Firs. Farther south after an open space is a Cilician Fir. All the other trees on this narrow strip between path and road we shall consider later, for they belong to another genus, the Douglas Fir.

Section 2

Section 2 of the Firs consists of two small separated areas on the west side of the two roads that separate them from Section 1 (Map p. 57). The first little area is on the north side of the Power House and in the depression partially surrounded by the bank that borders the walk. There are two small firs in the depression. They are

Abies lasiocarpa, the Alpine Fir

This species is native at high altitudes from Alaska south to Oregon and Colorado. Under optimum conditions it may attain a height of 160 feet, but at the upper limits of its range it is generally stunted and dwarfed. It is exceedingly hardy and can endure temperature conditions ranging from 90° above to 40° below zero. This is one of the few firs having leaves with white lines on both sides. Furthermore, the buds are completely covered with resin, the branchlets are pubescent and the needles are directed upward and forward. It is not a satisfactory tree in the Eastern States.

Now we must go south again, this time along the western side of the road and almost as far as the Elevated Station, passing the collection of hemlocks on our right. Two big sugar maples stand on the inside of the path just before we get to the elevated approach and west of them we see the last of the firs.

Nearest the Elevated Station there is a distinct group of four trees. Of these the two nearer the station are

Abies grandis, the Grand or Lowland Fir

This species has very distinct foliage, which is conspicuously pectinate, that is, it stands out on two sides of the branches as the teeth of a comb and the needles are quite long.

The Grand or Great Fir, native to the Northwest from Vancouver Island to northern California and east to Montana, is one of the biggest trees of the country, attaining a height sometimes of 300 feet. This tree, too, is not very satisfactory as an ornamental in this part of the country.

The other two trees in this group are Tomomi Firs (p. 75).

There remain now six more fir trees a few steps northward. The first we come to is a Nordmann's Fir (p. 74), and then comes a row of three extending westward. The one nearest the road is another Nordmann's and the middle one is a Nikko Fir.

The last specimen in the row nearest the railroad tracks is

Abies Picea var. **pendula,** the Weeping Silver-Fir

This is a pendulous form of the Silver Fir of central and southern Europe.

Of the two remaining firs in the last row the one nearest the railroad is a Cilician Fir and the other is a Nikko Fir.

General Discussion

There are about 35 different kinds of fir trees distributed in northern and mountainous regions of the Northern Hemisphere. They are all evergreen and to a great degree cold climate trees, though in the New World they extend as far south as Guatemala and in the Old World to North Africa and the Himalayas.

The firs are easily distinguished from the pines by not having their leaves in clusters. From the spruces they differ in having smoother twigs and trunk since the fallen needles leave only a scar and no spiny stalk. Furthermore, the cones of firs, when present, stand erect on the branches while those of spruces hang down.

The firs may be conveniently divided into two groups according as the tips of the needles are single-pointed or double-pointed by a tiny cleft.

Of a dozen different species having single-pointed leaves, four are in the Garden, *viz.*:

A. cephalonica, Greek Fir of Greece
A. concolor, White Fir of the western United States
A. lasiocarpa, Alpine Fir of the western United States
A. nobilis, Noble Fir of western North America

Of about twenty-five kinds with double-pointed leaves, six are in the Garden, *viz.*:

A. Momi, Momi Fir of Japan
A. homolepis, Nikko Fir of Japan
A. grandis, Grand Fir of western North America
A. Nordmanniana, Nordmann Fir of Caucasus
A. Veitchii, Veitch Fir of Japan
A. cilicica, Cilician Fir of Asia Minor

Of the nine species of fir indigenous to the United States, only two occur in the East, neither of which is in the collection. They are the common Balsam Fir found in the Northeast and extending well into the West, *A. balsamea,* and the Fraser fir, *A. Fraseri,* that has a rather limited range at high elevations in the Appalachian region from West Virginia to North Carolina and Tennessee.

Of the seven western species, four occur in the Garden. The three lacking species are the Red Fir, *Abies magnifiica,* one of the tallest firs of the Pacific Coast; the Bristle-cone Fir, *A. venusta,* that occurs in west central California; and the Cascade Fir, *A. amabilis.*

The firs are characterized, in one respect, by peculiar exudations from the resin vesicles in the bark. These exudations appear as blisters on the trunks and branches of the trees and when punctured yield their contents. In the north woods this juice is collected at certain times of the year from the Common Balsam. *A. balsamea,* and manufactured into Canada balsam, a preparation much used as a transparent cement in microscopic slide work.

Though possessing some timber value, these trees are of less lumber importance as a whole than the pines and spruces. The wood is soft and perishable and generally inferior. In Europe the

wood of *Abies Picea* is somewhat valued and in the Pacific States that of *A. grandis, A. concolor,* and *A. magnifica* is employed in the manufacture of fruit boxes and woodenware.

The firs are, however, handsome in cultivation and though usually of relatively short-lived beauty possess much ornamental value.

They prefer moist well-drained soil and cool situations. Around New York City summers are generally too warm for them for they normally are high-altitude trees. The most successful in the eastern states are *A. concolor, A. homolepis, A. Veitchii, A. cilicica,* and *A. Nordmanniana.*

PART 5—HEMLOCKS

BEAUTIFUL SHADE-ENDURING EVERGREENS

The collection of Hemlocks occupies a rather small area between the railroad and drive on the west side of the Garden. The area lies south of the 200th Street entrance and is a continuation of the last section of the Firs adjacent to the Elevated Railroad Approach (Map p. 57).

The first four low bushy spreading evergreens near the path on the west side of the road are

Tsuga canadensis var. **pendula,** the Weeping or Sargent's Hemlock

This is one of the most graceful and pleasing of pendulous conifers. It forms, generally, a flat-topped low broad mound of remarkable beauty. It is extensively used and worthy of recommendation.

This handsome variety of our Canada Hemlock is of native and natural origin. It was discovered about 1870 by General Joseph Howland near the summit of Fishkill Mountain near Beacon City on the Hudson River. Four plants were found and distributed to a corresponding number of persons, including Professor Sargent, whose name the plants now bear. One was retained by the discoverer himself. In 1924 the two plants thus originally disposed of were the only remaining living specimens of the original forms. The plants in cultivation are grafts, which vary in habit and appearance and have a less dense character than the originals, for they tend to form an erect stem and are looser and more tufted in habit. The remaining original of Professor Sargent is 6 feet high, 23 feet through, and has a circumference of 70 feet.

Other specimens of this handsome evergreen will be found at several places in the Garden. One that is particularly attractive in Spring, when the bright green new growth covers it, overhangs the water in the fountain before the Museum Building.

The isolated and more upright though small hemlock just north of these weeping forms is

FIGURE 10. Weeping Hemlock
Tsuga canadensis var. *pendula*

Tsuga Tsuga or **T. Sieboldii,** Siebold's or Japanese Hemlock

This is one of two hemlocks native to Japan, where it attains a height of 80 feet. The wood is quite durable and is used in Japan for house construction and for paper pulp. The bark is rich in tannin and is employed there for tanning purposes. The tree is distinguished by its polished notched rather broad needles and hairless shoots. Other specimens stand ahead of us.

Under cultivation this hemlock forms only a low bushy tree of very slow growth. It is not so hardy as the other Japanese Hemlock, which we shall soon meet, and should be planted in a sheltered situation.

Proceeding north, the next small evergreens stand in rows, not parallel, but generally extending toward the railroad from the road. The first such row, lying with a distinct bias to the others, has three small trees. The first of these near the road is

Tsuga canadensis var. **compacta,** the Dwarf Canada-Hemlock

This is a variety of the Canada or Common Hemlock. The specimen before us does not betray its varietal habit well.

The next in the row is another Siebold's Hemlock, and the last one is either the Canada Hemlock or some variety of it; its exact identity has not been determined.

In the second row of four trees, starting with the low branching one nearest the road we find first another Siebold's Hemlock, then another Dwarf Canada-Hemlock. The third and largest tree in the row is

Tsuga canadensis, the Canada Hemlock

This is one of our finest native evergreens, highly valued for its ornamental use. In addition to its beauty, its shade-enduring qualities recommend it. Its range extends from Nova Scotia to western Wisconsin, south to Delaware and southern Michigan and along the Appalachian Mountains to northern Alabama and Georgia. The original stand of hemlock that stood in this area at the advent of the white man was enormous. Most of it was left standing when the better white pine was first cut out but subsequent

logging operations began to remove this material that at first was regarded as rather inferior. Today hemlock is largely manufactured into coarse lumber for outside uses.

The bark of this tree has long been the principal source of tanning material. Today the tanning industry still depends to a marked degree upon the remaining hemlock forests of the eastern United States for its raw material.

The needles of the hemlock constitute its main distinguishing feature. On their lower surface they bear two distinct white lines, which give the lower side of the foliage a glaucous or silvery appearance. Other conifers, however, are similarly marked but the needles of the hemlock are smaller and delicate and stand out in two opposite rows on the branchlets. The cones, moreover, are rather small and characteristic. Furthermore, the inner bark on mature trees is generally red, as is betrayed by picking off the outer layers. The trees attain heights of 80 and 100 feet.

One of the best natural features of the Garden is the Hemlock Grove that borders the Bronx River on both sides as it flows through the Garden. Here a bit of the virgin forest of old hemlocks has been maintained. Behind the large Canada Hemlock, recently mentioned, stands another Siebold's Hemlock.

The next row begins with the small tree that stands nearest the road of any in this entire group. The row extends at an angle away from the last and contains four plants. The first is

Tsuga diversifolia, the Hairy-twigged Japanese-Hemlock

There are but two hemlocks native to Japan, one of which we have already met and this is the other. At first one might very easily confuse them or note no difference, for they are indeed very similar. Closer observation, however, will soon show that the leaves of *T. diversifolia* are shorter than those of *T. Tsuga,* giving a rather distinctive appearance and that the branchlets are hairy while those of Siebold's Hemlock are not. There is another specimen of this Hairy-twigged Japanese-Hemlock ahead of us, the first in the next row.

To the Japanese this species is known as *Komi-tsuga* or *Kuro-tsuga.*

FIGURE 11. Entrance to the Hemlock Grove

The second specimen in the diagonal row is a Dwarf Canada-Hemlock and the next very low shrubby plant is

Tsuga caroliniana, the Carolina Hemlock

This is a native species, with a very restricted range, extending in the mountains from southern Virginia to northern Georgia. It is regarded as one of the handsomest evergreens for ornamental purposes, possessing great beauty and grace in its very dark compact and drooping habit. The specimen at hand unfortunately shows none of the fine qualities of the species.

The fourth and last plant in the diagonal row is a Siebold's Hemlock and directly back of it toward the railroad but not in the diagonal row stand two Canada Hemlocks, the first a small and sickly specimen and the last a large more mature one.

The last row contains three trees and is approximately parallel to the preceding bias row. The first is a Japanese Hemlock, the second is a Canada Hemlock and that last rather nicely shaped rounded specimen that stands near the road leading into the power house is another Hairy-twigged Japanese-Hemlock. There remains one more small tree, a Canada Hemlock.

General Discussion

There are altogether nine or ten different known hemlocks. Four of these are native to the United States; two in the Eastern States, *Tsuga canadensis* and *T. caroliniana,* and two in the West, *T. Mertensiana* and *T. heterophylla.* Of the foreign ones, two are found in Japan, *T. Tsuga* and *T. diversifolia.* The others, of little importance, grow in China and the Himalayas.

The hemlocks are all evergreens, bearing rather small cones about one inch in length. They are generally recognized by their flattish needles arranged on the twigs in two opposite ranks. In this respect they resemble the firs. The leaves of the latter, however, are attached directly to the twigs, leaving a circular scar when they fall while those of the hemlocks arise from a slender stalk which lies pressed against the twig.

Excepting that of the western and Japanese species, *T. heterophylla* and *T. Tsuga,* the light, soft, brittle and coarse-grained

wood of hemlock is not durable or much valued. The bark is rich in tannin, as has already been stated concerning the Canada Hemlock.

Ornamentally the hemlocks rank very high. They are stately and graceful without the stiff formal appearance of many of the other conifers. They are not particular as to soil, providing it contains constant and sufficient moisture. They are easy to transplant and propagation is secured by seeds or by grafting on stock of the Canada Hemlock. The varieties and the Japanese species are also raised from cuttings.

PART 6—DOUGLAS FIR

AMERICA'S GREAT TIMBER TREE AND A FINE ORNAMENTAL EVERGREEN

The collection of Douglas Fir is located near the entrance to the Elevated Railway Approach and on the narrow planted area between the roads there (Map p. 57). All the evergreens north of the path that runs across the strip at the entrance from one road to the other are Douglas Fir. Eight other similar trees stand on the slight embankment across the inner road.

A very much larger group stands in another part of the Garden, near the Iris, Peony, Tulip, and Narcissus collections. These trees are

Pseudotsuga mucronata or **P. taxifolia,** the Douglas Fir or Douglas Spruce

This is one of our finest large ornamental evergreens. It is native to the western part of our country and in its range shows two distinct types. Along the northern Pacific Coast it becomes a tall tree up to 300 feet in height and is of outstanding lumber importance. But that form is inclined to be tender. In the Rocky Mountain part of its range it becomes a smaller tree of slower growth, but is not so tender. This is the form that is extensively used for ornamental planting in this part of the country.

Much as we found in the case of the Colorado Spruce, the Douglas Fir shows color variations. The tender coastal form is typically green and the Rocky Mountain type bluish with gradations between. Any group of seedlings will exhibit these chance variations and any especially blue individuals may be perpetuated by grafting.

Ornamentally, the Douglas Fir is highly esteemed. It makes a handsome tree of rapid growth and is one of the finest of our larger evergreens.

For about two decades, more Douglas Fir timber has been felled in this country than of any other single kind of tree. Only the combined output of the four or five southern yellow-pines

FIGURE 12. Douglas Firs
Pseudotsuga mucronata

excels it in quantity of production. Moreover, its cut has been increasing steadily while that of the pines has been waning. In 1923 about 8¼ billion board-feet of Douglas Fir were felled on the Pacific Coast, which constituted almost a quarter of the total lumber production in the country. All this timber comes from a relatively small territory concentrated in Washington and Oregon. But the lumber is distributed and consumed all over the country. Here lies one of the greatest forestry problems, the increasing localization of timber production on the West Coast and the nation-wide distribution with high transportation charges.

The Douglas Fir has long suffered a variety of common names. Under cultivation it is generally known as such or as Douglas Spruce. The former is favored by the smooth twigs and soft foliage. Other names that have been associated with it, particularly in the lumber trade on the West Coast, are Red Fir, Yellow Fir, Spruce, Fir. Pine. Red Pine, Puget Sound Pine, Oregon Pine, and others.

The range of this tree extends from southern Alaska along the coast to the Sierra Nevada Mountains in central California and eastward through the Rocky Mountains into Colorado. The finest development is found in Washington and Oregon between the Cascades and the ocean, where heights up to 250 feet and diameters of 12 feet are attained.

The Douglas Fir is quite readily distinguished from other similar evergreens. The form of trees in cultivation is well exemplified by those at hand. The foliage is somewhat pendulous at the tips, the twigs are smooth as in the true firs and the buds are non-resinous, reddish, and very distinctly pointed. These trees thrive best in a porous sandy soil and their cultivation is very similar to that of the spruces. Growth is rapid. Though the Rocky Mountain form, which is the one in cultivation, is quite hardy, severe exposure is apt to be injurious. Consequently, groups of the trees are safer than exposed individuals unless somewhat sheltered. It is, therefore, a mistake to use Douglas Fir for a windbreak. Unlike the true firs they have fibrous roots like the Norway Spruce and so transplant readily.

General Discussion

There are four different kinds of *Pseudotsuga,* only one of which is of great commercial importance. In addition to the one which is in the Garden there is another native one found on the steep, rocky slopes in the mountains of southern California, *P macrocarpa.* This species is tender and consequently not suited for ornamental use in colder regions. It has local lumber value and is distinguished by its large cones that may be half a foot in length. The other species are native to China, Japan, and Formosa and are scarcely known in American cultivation.

There is striking similarity between the Douglas Firs and the true firs but in the latter the scales of the cones gradually fall off while in the Douglas Firs they do not.

PART 7—CYPRESSES

VERY VALUABLE ORNAMENTAL EVERGREENS

Section 1

Section 1 of the Cypresses is located along the western half of the path close to the drive in front of Conservatory Range 1 (Map p. 57). As indicated on the map, we shall begin at the eastern extremity of the path that extends from the western side of the Conservatory toward the Elevated Railway Approach. The evergreens here serve as a background for the flower bed. All the trees in this first Section are either Sawara Cypress or Hinoki Cypress, both natives of Japan, or some form of these two trees. The number of known varieties is great and the nursery name of "Retinospora" is applied to nearly all of them.

The first evergreen nearest the Conservatory is

Chamaecyparis obtusa var. **nana,** the Dwarf Hinoki-Cypress

This is one of the finest ornamental evergreens. It is characterized by its dark color and denseness of foliage caused by short branchlets and by very slow growth. It may attain a height of ten feet or more and when in a thrifty condition is very handsome because of its dense rich dark-green foliage.

Next we see two larger plants set back a bit with prominently bluish feathery foliage conspicuously different from that of the form we have just passed. There are several similar trees filling the interior of the group behind these two. They are all

Chamaecyparis pisifera var. **pseudo-squarrosa,** the Moss Retinospora

This is a rather common variety of the Japanese Sawara-Cypress and is very readily recognized by its bluish color and feathery foliage. The botanical name assigned to it here is not generally found in the literature, where it usually is designated merely as *Chamaecyparis pisifera* var. *squarrosa.* The additional name *Veitchii* is sometimes added to this, for the plant is also

known as Veitch's Sawara-Cypress. In the Garden, however, the shorter scientific name just given has been reserved for another lower and more prostrate form which we shall see later.

A more pleasing shape which the Moss Retinospora assumes in the open will be apparent when we meet other specimens.

The next tree to the right of the two just pointed out and close to the bed we should recognize as another Dwarf Hinoki-Cypress and behind it we can see the Moss Retinosporas or Veitch's Sawara-Cypresses within the group.

The next five larger trees extending in a row down the bed are

Chamaecyparis pisifera var. **plumosa,** the Plumed Sawara-Cypress

This is one of the most extensively planted forms, commonly known as the Plumed Retinospora. Unfortunately, it is subject to windburn, when the foliage turns brown.

At the end of this row we find another Dwarf Hinoki-Cypress, set back a bit, taller but not so fully foliaged as the other specimens we have already passed. To the right of it and closer to the flower bed is another dark-green conifer, low and close to the ground. Except for its height it is scarcely distinguishable from the Dwarf Hinoki-Cypress. It is

Chamaecyparis obtusa var. **gracilis,** the Slender Hinoki-Cypress

This and the Dwarf Hinoki-Cypress are very similar and at times difficult to separate. The former is characterized by its stringy new growth in spring and the foliage is not so compact. A taller tree of this variety stands ahead of us.

Directly to the right of this little Slender Hinoki-Cypress, the small lighter-colored evergreen of about the same size is a Sawara Cypress, which we shall consider when we see larger trees. To the right of it are four small yellowish plants with stringy foliage. These young ones and the six larger yellowish ones in a row behind them are

Chamaecyparis pisifera var. **filifera aurea,** the Golden Thread-Retinospora

This second example of compound variation is very distinctive, with its slender stringy branchlets of yellow. Another specimen stands somewhat concealed to the left of the last Dwarf Hinoki-Cypress and directly behind the last Plumed Retinospora.

The Golden Thread-Retinospora is a very striking plant during summer, when its golden color stands out against a green background. It is admirably suited for giving a splash of color to masses of darker planting.

In a great many horticultural forms of evergreens the particular feature that makes a plant this or that variety or form is noticeable at only certain seasons and at other times may be absent. In the specimen before us the yellow or golden color of the tips of the foliage is conspicuous only in the early summer. This fact must be borne in mind when we consider any colored variety of evergreen.

The taller trees that stand in a towering mass behind these six are

Chamaecyparis pisifera var. **plumosa aurea,** the Golden Plumed Sawara-Cypress

Known also as the Golden Plumed-Retinospora these are merely the golden variety of those we have already noted along the flower bed. They, too, show their varietal coloring only in summer.

At the end of the double row of Golden Thread-Retinosporas stands a taller Slender Hinoki-Cypress already referred to. Beyond it, also along the bed, are eight feathery bushy evergreens in a row. If it is late spring or summer we will notice that five of them are yellowish, the third, fourth, and last three going down the bed, while the others have the bluish green we have already encountered. The latter three are Moss Retinosporas (p. 92), while the five yellowish ones are

Chamaecyparis pisifera var. **pseudo-squarrosa sulphurea,** Sulphur-colored Moss-Retinospora

During the dormant season these eight shrubs look all alike but when new growth appears the light-yellowish foliage on five of them is very striking. These yellow ones obviously are merely forms of the Moss Retinospora. All these specimens show the very attractive appearance which Veitch's Retinospora may exhibit at its best.

The last evergreen in the row at the corner of the bed is another Plumed Retinospora.

Now we shall turn the corner and observe that a path or opening extends into the group behind those we have just noted. At the left side of this opening behind those last ones along the flower bed are three more Plumed Retinosporas while on the right hand side are several golden forms of this variety.

Let us now go into the opening. Behind the first two trees along the right-hand side as we go in the next two are Plumed Retinosporas. Beyond the second of these the line of taller trees curves in an arc to the right. The first two trees in this arc next to the last Plumed Retinospora are

Chamaecyparis pisifera, the Sawara Cypress

This is one of two kinds of Cypress native to Japan. It has given rise to a great many valuable horticultural forms which we are now encountering.

Trees of the genera *Chamaecyparis, Thuja, Juniperus,* and certain others have two kinds of leaves, the one scale-like and the other pointed. The latter form occurs only in young plants, especially seedlings, to be lost later in their development. This so-called primordial foliage is very different in appearance from that of the adult plants. The occurrence of these two kinds of foliage on the same plant was not always known and when these plants were first studied they were regarded as entirely different according as they had scaly or pointed leaves. The name Retinospora was assigned to the pointed juvenile forms of the two Japanese Cypresses. Later, when their identity was disclosed, these trees were given the generic name of the adult trees. But in horticultural nomenclature the name "Retinospora" has been

retained in connection with the juvenile forms of *Chamaecyparis* and of other genera, as *Thuja,* which we shall see later.

In some of these plants, especially if they have insufficient nourishment, the pointed primordial foliage is retained longer than usual. These forms if propagated by cuttings tend to retain the juvenile foliage without change to the more adult type. By repeated successive cuttings through many generations of very distinct juvenile forms the many garden varieties which are about us have been established.

The foliage of these juvenile forms very closely resembles that of some junipers, as we shall see. The leaves are usually pointed, spreading, and in pairs but are softer and not so sharp as are those of the junipers. Moreover, they are mostly marked with whitish or grayish lines beneath, which is never the case in junipers. The latter have whitish marks on the upper side of the leaves.

Frequently, however, one or more branches on these plants will revert to the more natural foliage and be quite noticeable. We shall see several examples of this. Occasionally, however, fruit is borne on the juvenile foliage without change to adult form. Seeds thus formed produce typical plants that do not retain their juvenile foliage much longer than usual.

In Japan the Sawara Cypress attains a height of 150 feet and a girth of 25 feet. In that country it has long been cultivated in gardens and temple grounds and its wood is used to some extent as lumber. We shall meet other specimens of it and only by repeated observation can its recognition be assured.

After these two trees comes another Plumed Retinospora and the last two tall trees completing the arc are Golden Plumed-Retinosporas. Within this arc of taller trees are three smaller bushier ones. The more open tree-like specimen is another Golden Plumed-Retinospora whose colored foliage is exceptionally striking in summer. The other two more bushy and denser forms are

Chamaecyparis pisifera var. **plumosa sulphurea,** the
Sulphur-colored Plumed-Retinospora

This is another very distinctive and handsome variety when its

sulphurous color shows on the new growth in summer, changing the plant into a great yellow ball. Close comparison with the neighboring tree will show that this variety differs from var. *plumosa aurea* in its more delicate foliage, not so distinctly plumed but finer, as well as in its more compact habit. There is another and very similar specimen which we can see tucked in behind those yellow stringy shrubs along the flower bed.

On one of these specimens we should notice our first example of reversion which we mentioned as being frequently found in these plants. One of these three shrubs at least presents a branch whose foliage is different from that on the rest of it but which matches with that of the Golden Plumed-Retinospora close by.

Let us now return to the main path along the road and proceed eastward. We should first notice a single bluish feathery Moss Retinospora or Veitch's Sawara-Cypress surrounded by the Golden Plumed-Retinosporas, already noted. Directly behind it the tallest tree is the Sawara Cypress we spotted from within the group. There is another apparently cut-off specimen of this last-mentioned species as well as another Plumed Retinospora a bit to the right and behind the last Golden Plumed-Retinospora along the path. Their foliage should betray them.

Next we come to seven stringy yellow-foliaged plants, two of which are somewhat separated from the others. They are Golden Thread-Retinosporas. Behind them the tall trees in the background are mostly Plumed Retinosporas. The bushy bluish feathery plant close to the path that separates the last of the yellow ones from the others is a Moss Retinospora or Veitch's Sawara-Cypress, with its bluish foliage.

To the left of it and behind the fifth Golden Thread-Retinospora is another yellowish form with flat frond-like foliage. It is

Chamaecyparis obtusa var. **crispata aurea**

In this specimen we discover another feature of all these forms which should be understood. This name of var. *crispata aurea* has been retained for this plant and others like it though it is not to be found in general usage. It is a name assigned by the

nursery that furnished these plants and that has attributed to them some varietal feature. This is a rather common practice though ofttimes it is exceedingly difficult to detect any particular distinguishing characters of these nursery forms. In the specimen before us we can be sure it is at least an aurea variety of *Chamaecyparis obtusa* and any other name that may be added is a matter of choice and viewpoint.

To the right of this last one is the sixth Golden Thread-Retinospora and directly behind this the taller evergreen is

Chamaecyparis obtusa, the Hinoki Cypress

This is the other cypress native to Japan which also has given rise to so many of the forms we are considering. In that land it attains a height of 150 feet, though usually it is smaller. The bark of this tree is highly valued by the Japanese for roofing purposes, since it peels off the trees in long thin strips and withstands the extremes of heat and damp and is very durable. The wood itself is regarded by the natives as superior to that of any other of their conifers and on this account is much used for reforestation work.

It will be observed that the Hinoki Cypress resembles its horticultural varieties much more closely than does the Sawara Cypress its varieties.

To the right of the bluish Moss Retinospora along the path, the last Golden Thread-Retinospora is surrounded by three similar bushy evergreens whose many stems arise from the ground close together. They are

Chamaecyparis obtusa var. **gracilis compacta,** the Compact Slender Hinoki-Cypress

This is a very pleasing upright bushy variety quite distinct in its habit. Directly behind these the taller tree is a Sulphur-colored Plumed-Retinospora which shows considerable reversion to the Golden Plumed-Retinospora.

We now come to the service road that runs under the big greenhouse. As we turn into it, the first two bushy plants on our

left are Compact Slender Hinoki-Cypresses. All the bushy bluish ones behind these are Moss Retinosporas.

There are other trees within the group which may be identified by their tags.

This completes our survey of the Cypresses and Retinosporas west of the service road. On the other side of this short road and nearer the inner end are five Golden Thread-Retinosporas. Their branches extend to the road and five or six more are located behind. The latter scarcely show their yellow foliage because of their shaded position. The taller trees in the background are for the most part Sawara Cypress. We shall note them again, along with others in the background, when we consider them from the other side.

Directly behind the two right-hand Golden Thread-Retinosporas along the service road are three taller dark-colored evergreens with very distinct and peculiar foliage. They are

Chamaecyparis obtusa var. **filicoides,** the Fernspray Retinospora

This is one of the oddest and most distinctive forms in the collection.

The two yellowish bushy shrubs to the right of the Golden Thread-Retinosporas and nearest the corner are Sulphur-colored Plumed-Retinosporas (p. 96). Between these and almost concealed by them is a slender dark Dwarf Hinoki-Cypress. The large green ones behind them are Slender Hinoki-Cypresses.

Now we shall proceed eastward along the main path. The first bush around the corner is another Sulphur-colored Plumed-Retinospora. To the right of it is a Dwarf Hinoki-Cypress. Next are two taller Golden Plumed-Retinosporas separated by another bushy Sulphur-colored Retinospora (p. 96). Behind this last one is another Compact Slender Hinoki-Cypress.

The next yellow evergreen to the right, back a bit, is a Golden Thread-Retinospora (p. 94). A similar one is to the right of it and a bit back, while directly behind and almost concealed by it, is

Chamaecyparis pisifera var. **filifera pendula aurea,** the Golden Weeping Thread-Retinospora

The habit of this form is quite distinct from that of the non-pendulous form.

To the left of these and within the group the large prominent bushy green specimen is

Chamaecyparis pisifera var. **filifera,** the Thread Retinospora

This is one of the most dependable forms of Retinospora, for it is very hardy.

The tallest trees in the background are Sawara Cypress.

The next two trees along the path are

Chamaecyparis obtusa var. **gracilis aurea,** the Golden Slender Hinoki-Cypress

These are merely yellow forms of the Slender Hinoki-Cypress.

Behind these two are two low and rather concealed Golden Thread-Retinosporas and two larger Thread Retinosporas. To the right of the uppermost of these two inside Thread Retinosporas is a single slim specimen of another new and odd form. It is

Chamaecyparis obtusa var. **lycopodioides,** the Club-moss Retinospora

This is an odd form of the Hinoki-Cypress. It may become a very attractive dark-green dense evergreen. The specimen at hand is, of course, very poor.

The next two large broad and very open plants along the path are old Sulphur-colored Plumed-Retinosporas. Behind the left hand one is a large Thread Retinospora, and behind the right hand one a Golden Plumed-Retinospora.

The next very large tree along the path is another Golden Plumed-Retinospora. To the right in front and close to it is a very fine Dwarf Hinoki-Cypress. Next comes a very nicely shaped and larger

Chamaecyparis obtusa var. **aurea,** Golden Hinoki-Cypress

Behind these the very tall tree is a Golden Plumed-Retinospora.

Next to the Golden Hinoki-Cypress the lower bushier plant is

Chamaecyparis pisifera var. **filifera pendula,** the Weeping Thread-Retinospora.

Behind it is another Golden Hinoki-Cypress and close behind this latter a Dwarf Hinoki-Cypress.

The next yellow bushy plant by the path is a Sulphur-colored Plumed-Retinospora.

Next, close to the path, is a Plumed Retinospora and the four very large trees behind and to the right of it are Sawara Cypresses with *var. plumosa* in the middle rear and *var. aurea* nearest the path.

Next by the path is a Hinoki Cypress and then the very compact low and very small evergreen is

Chamaecyparis obtusa var. **nana compacta,** the Compact Dwarf Hinoki Cypress

This form is certainly one of the finest of dwarf evergreens, for it is exceedingly slow-growing. The plant at hand is quite old.

Immediately behind it are two

Chamaecyparis pisifera var. **sulphurea,** the Sulphur Sawara-Cypress

Close examination will show the foliage of these two plants to differ in form from that of the var. *plumosa* plants.

Next along the path is a Moss Retinospora and then come two Golden Thread-Retinosporas, one behind the other, with a big Plumed Retinospora in the background. Next to the right is another specimen of the peculiar Fern-spray Retinospora and then a very nice Dwarf Hinoki-Cypress. Then comes a broad globose Sulphur-colored Plumed-Retinospora. A large Sawara Cypress stands in the background. To the right of it is

Chamaecyparis obtusa var. **aurea Youngii,** Young's Golden Hinoki-Cypress

This form, *Youngii,* is claimed to differ from the plain variety, *aurea,* in a paler yellow color and more pendulous foliage.

Next by the path is a large Sulphur-colored Plumed-Retinospora and behind it a greener Thread Retinospora. Next by the path

is a Moss Retinospora and then another big Sulphur-colored Plumed-Retinospora in the back, with a Dwarf Hinoki-Cypress to the right. The very open scraggly one next by the path is

Chamaecyparis pisifera var. **plumosa albospica,** the White-tipped Plumed-Retinospora

At the proper season, when new growth appears, the whitish-tipped plumes of this form are noticeable.

Behind it are a Thread Retinospora to the left and a lower Weeping Thread-Retinospora to the right.

To the right of the White-tipped Plumed-Retinospora is a Moss Retinospora. Behind it the low creeping form is

Chamaecyparis pisifera var. **squarrosa**

The next two small dark-colored and similar-looking trees, one behind the other, are both Dwarf Hinoki-Cypress. The very dense bushy specimen next is a Sulphur-colored Plumed-Retinospora with a plain Plumed Retinospora close behind it. To the right of this last one is a Golden Thread-Retinospora and in front of this one is a *Chamaecyparis obtusa* var. *crispata aurea* (p. 97). Still further front nearer the path is a darker Dwarf Hinoki-Cypress.

Next we see three trees, one behind the other. The foremost is another *Chamaecyparis obtusa* var. *crispata aurea.* The middle one is

Chamaecyparis obtusa var. **magnifica**

This variety is very similar to the var. *gracilis* and certain others and presents difficulty in separating it.

The third and largest tree in the rear is a Plumed Retinospora. The two remaining equally tall trees to the right are the same. Between the first two of these three is another *Chamaecyparis obtusa* var. *magnifica* crowded in and a var. *crispata* farther front, another specimen of which stands just between the path and the second big Plumed-Retinospora. To the left of this last one is a

Dwarf Hinoki-Cypress, and to the right is the last low dark evergreen. It is

Chamaecyparis obtusa var. **pygmaea,** Pigmy Hinoki-Cypress

This is a low prostrate form similar otherwise to var. *nana.*

The remaining five globose shrubs at the end are Sulphur-colored Plumed-Retinosporas.

It might be well, now, to inspect this entire group east of the service road from the bank behind the trees. Beginning at the western end we see first a Golden Thread-Retinospora surrounded by four large equally sized Sawara Cypresses. To the left are several more Sawara Cypresses. Turning eastward there are, half way down the bank, two Thread Retinosporas. Below them are the two Golden Slender Hinoki-Cypresses already noted from the path.

Next along the bank nearer us, is another Sawara Cypress and below it one of the old Sulphur-colored Moss-Retinosporas with a Thread Retinospora between them. The slender one close by us is the Fern-spray Retinospora.

Next to the left we pass a Golden Plumed-Retinospora and below it is the other Sulphur-colored Plumed-Retinospora. Then to our left is a lower dense Sawara Cypress near us and then a big Golden Plumed-Retinospora with a similar one below it.

Next comes a Golden Hinoki-Cypress and a Dwarf Hinoki-Cypress together, followed by a big Sawara Cypress to the left. After that is an equally tall Plumed Retinospora and then a great Sawara Cypress.

Next is a smaller Sulphur-colored Retinospora with a similar one below it. Then a large Plumed Retinospora followed by an even taller Sawara Cypress.

Next we see a very nicely shaped round Thread Retinospora with a Sulphur-colored Plumed-Retinospora below it; in the middle is a Young's Golden Hinoki-Cypress (p. 101) close to the big Sawara Cypress. Next to the left is another Sulphur-colored Plumed Sawara-Cypress similar to the one nearer the road.

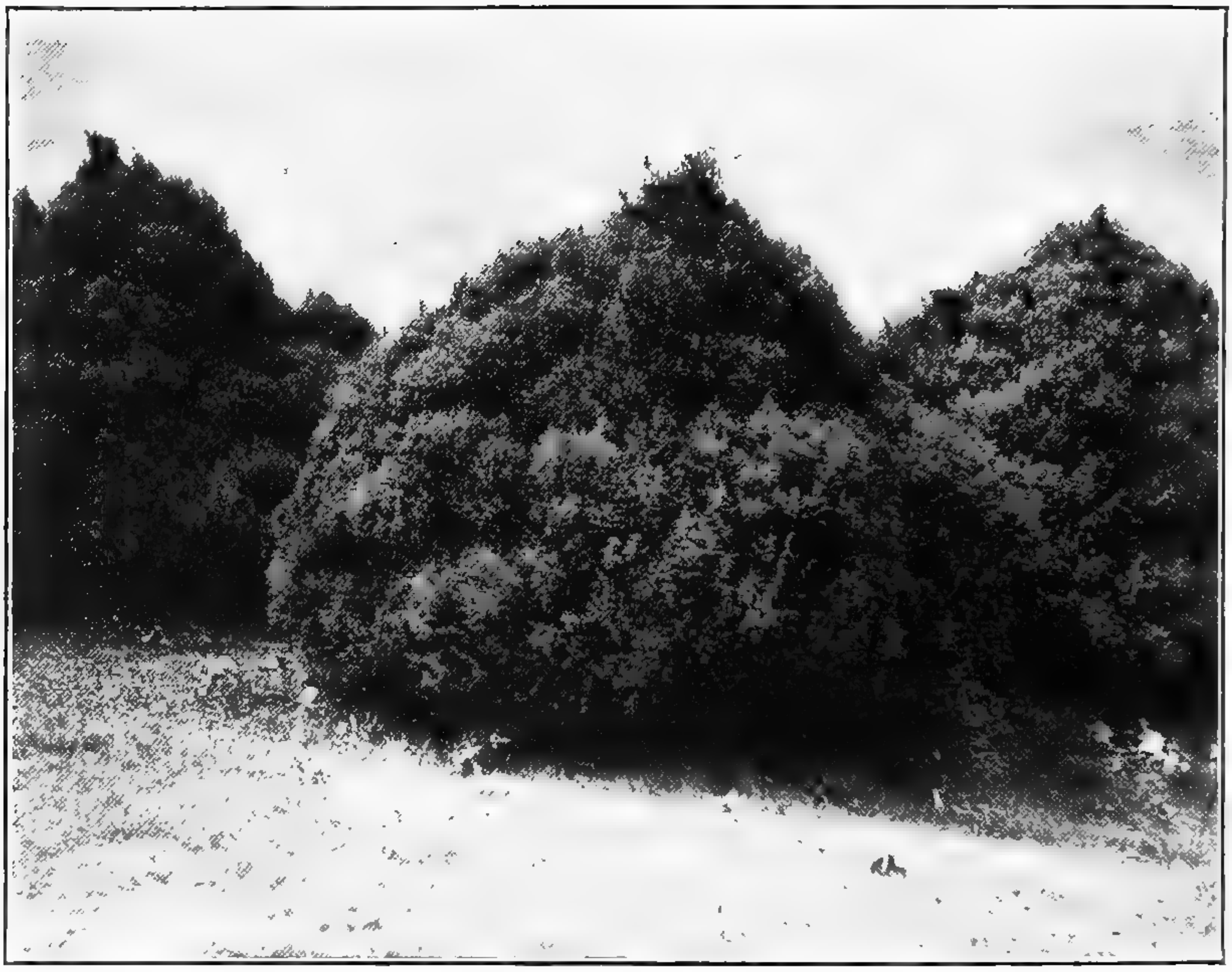


FIGURE 13. Sulphur-colored Plumed-Retinospora
Chamaecyparis pisifera var. *plumosa sulphurea*

Then comes another Thread Retinospora with a Dwarf Hinoki-Cypress to the right below it. To the left of the Thread Retinospora is a Weeping Thread-Retinospora. Then comes the low *Chamaecyparis pisifera* var. *squarrosa,* spreading on the ground. Next is a taller Plumed Retinospora followed by a Golden Thread-Retinospora and then three more tall Plumed Retinosporas. Between the first two is a *Chamaecyparis obtusa* var. *magnifica.*

The last yellow bushy shrubs are Sulphur-colored Plumed Retinosporas.

Section 2

Section 2 of the Cypresses is located on the south side of the outer road in front of Conservatory Range 1 and near the eastern end of the road. The trees stand near the apex of the area between the road and the path on its south side (Map p. 7). Going westward down this sloping path from the road the first two evergreens on our right are

Chamaecyparis Lawsoniana var. **Alumii,** the Blue Pyramidal Port-Orford Cedar or Scarab Cypress

This is one of the handsomest blue-tinted evergreens. The foliage is more delicate and softer than that of the Colorado Blue-Spruce and in spring when the fresh new leaves appear this variety is exceptionally fine. Its habit is very erect and pyramidal, as we shall see in other trees just ahead.

The next smaller evergreen near the foot of the low stone wall is

Chamaecyparis thyoides var. **andelyensis,** the Andelyan White-Cedar

This variety shows no particular characters and does not thrive well in the Garden.

The next tall evergreen close to the stone wall and a similar one almost directly in front of it are

Chamaecyparis Lawsoniana, the Port-Orford or Lawson Cypress

This is one of our handsomest ornamental evergreens but unfortunately it does not do well in a dry climate. If it has sufficient moisture it is very hardy and valuable. It is native to the moist coastal region from southern Oregon to northern California. In this very limited range this cypress sometimes attains a height of 175 feet. The wood is very aromatic and is made into clothes chests and many other articles. It was formerly much used in shipbuilding on the Pacific Coast.

Almost seventy different garden varieties of this tree have originated in one place or another. The leaves are exceedingly minute and give the almost feathery fineness to the foliage.

The tall bluish-colored tree close to this last one on its eastern side is another Scarab Cypress. The shorter one in front of these is another Lawson's Cypress.

Next along the path we see three low pendulous forms. They are

Chamaecyparis nootkatensis var. **pendula,** the Weeping Yellow-Cypress

This is a weeping form of the Yellow Cypress which stands farthest to the left.

Behind the first of these pendulous forms are two trees next to one another. They are

Chamaecyparis thyoides, the Coast White-Cedar

This is the common White Cedar of the Atlantic Coast, sometimes known as Southern White-Cedar to distinguish it from the Northern White-Cedar or Arbor-Vitae.

Behind the right hand one of these and near the stone wall is a pendulous form,

Chamaecyparis nootkatensis var. **glauca,** the Blue Nootka-Cypress

The next tall tree to the left close to the wall is a Lawson's Cypress and directly in front of it is a smaller Scarab Cypress. Next are four more Scarab Cypresses, forming a rectangle with a

Coast White-Cedar in the center. The last tall tree in the background is another Scarab Cypress.

The two remaining lower trees in the foreground with somewhat drooping foliage are

Chamaecyparis nootkatensis, the Yellow Cypress or Yellow Cedar

The Yellow Cedar, known also as Nootka Cypress, attains heights of 100 feet and more along the Pacific Coast, where it is native from Alaska to Oregon. In the Garden this species does not grow well, undoubtedly because of the relatively dry warm summers.

The foliage of this species somewhat resembles that of Lawson's Cypress but it is coarser and duller green. The cones, furthermore, have triangular pointed processes which are absent from those of Lawson's Cypress.

The wood of Yellow Cedar is very valuable on the West Coast, where it has been much used in shipbuilding and other industries.

General Discussion

Only six kinds of Cypress are known. They are native to the Atlantic and Pacific Coast regions of North America, to Japan and to Formosa. In eastern North America is *Chamaecyparis thyoides,* the White Cedar, and on the West Coast are *C. Lawsoniana,* the Port-Orford Cedar, and *C. nootkatensis,* the Yellow Cedar. In Formosa one species is endemic, *C. formosensis,* and in Japan are the two remaining species, *C. obtusa* and *C. pisifera.* They are all trees of great size. *C. formosensis* grows 190 feet tall, with a trunk 60 feet in girth, the largest of all coniferous trees indigenous in the Old World north of the Equator and rivaled only by the great Cryptomeria of Japan, which we shall meet later.

All these trees are of considerable timber value and ornamentally, as we have seen, their numerous forms are unexcelled.

These trees grow best in somewhat moist but well-drained sandy loam and partial shade. They all require shelter against drying

winds. Port-Oxford and Hinoki Cypresses like drier, the others, more moist situations and *C. thyoides* grows well in swamps. All the Retinosporas and dwarfer forms may be increased by cuttings and in others veneer grafting is preferable.

The cypresses are the first evergreens we have met so far with scaly leaves in their wild forms. It is difficult at times and well nigh impossible to distinguish their foliage from that of the Arbor-Vitae which we shall soon see. Both genera differ markedly, however, in their fruit, which is seldom present to assist in distinguishing them. The cone of *Thuja* is small and elongate with each scale as long as the whole cone while that of *Chamaecyparis* is also small but more globose and composed of shield-shaped scales.

FIGURE 14. A Mixed Planting of Retinosporas, Spruces, Arbor-Vitae, and other conifers, well protected from drying winds.

PART 8—JUNIPERS

VALUABLE ORNAMENTAL EVERGREENS OF LITTLE ECONOMIC IMPORTANCE

Section 1

Section 1 extends along the inside of the path on the east side of the circular drive leading to Conservatory Range 1 (Maps pp. 7 and 57). Near the junction of the path and drive is a conspicuous clump of dense evergreens. The plants composing it are

Juniperus chinensis var. **Pfitzeriana,** Pfitzer's Juniper

This is one of the best and most popular ornamental evergreens. Individual plants make a fine showing and groups of them, as we see here, form splendid evergreen masses. These plants branch very low and their heavy foliage very frequently causes the stems to split near the base.

East of this clump the collection extends along the inside of the path and consists of individual separated trees. If we step inside the group it will become apparent that they are set in three approximately parallel lines. One of these rows extends along the foot of the bank. Let us begin with the first tree at the western end of this row close to the clump of Pfitzer's Juniper and follow it, disregarding, for the time, the other trees. This first slender tree is

Juniperus chinensis, the Chinese Juniper

The Chinese Juniper is native to China, Mongolia, and Japan, and may attain a height of 60 feet. It may usually be distinguished from the native species, which we shall soon see, by the occurrence of both adult scale-like leaves in pairs and juvenile pointed leaves in threes on the same trees. Both species are the two most common tree-like junipers found in gardens. Both, as we shall see, have given rise to a great number of varieties.

The next five trees, of which the third is a bit out of line, are

Juniperus virginiana var. **glauca,** the Silver Red-Cedar

This is a very fine natural variety of the native Red-Cedar. Its bluish-gray foliage, though not always very apparent, has value in modifying the possible monotony of an evergreen setting.

Next, straight ahead along the bank, is

Juniperus virginiana var. **Cannartii,** Cannart's Red-Cedar

This variety is said to be "a compact pyramidal form with dark green foliage and bluish bloomy fruit."

The next two trees are Chinese Junipers, followed by a Silver Red-Cedar and then another Cannart's Red-Cedar. Then comes a Variegated Pyramidal Chinese-Juniper, better specimens of which we shall see later.

Then comes a Silver Red-Cedar, a bit out of line, followed similarly by a Chinese Juniper. Next in line, along the bank again, is a Chinese Juniper, two Silver Red-Cedars, and then a low

Juniperus Sabina, the Savin Juniper

This is a spreading or procumbent species native to the mountains of central and southern Europe extending into the Caucasus and western Asia. The branchlets have a rather strong disagreeable odor when bruised. We shall meet other specimens of this species and gradually become familiar with it.

Following the Savin, comes a

Juniperus sphaerica, Fortune's Juniper

This species is generally regarded as identical with *J. chinensis.* However, plants secured under this name seem to be hardier in the Garden.

Next are two more Silver Red-Cedars. The last one stands just beyond the bend of the embankment on our left. Before observing the trees in this broader area let us finish with those in the narrow strip we have just traversed. So we must return to our starting point at the Pfitzer's Junipers.

Including the first one with which we began enumerating the trees in the first row along the bank, there are six Chinese Junipers. The first two trees along the path are of this group and the other four are the remaining first trees.

Now we can follow a second, rather distorted, line of trees that extends along the middle of the Section between the row we have already gone over and the rather distinct row along the path.

The first five beyond the Chinese Junipers are Silver Red-Cedars. Next is a Chinese Juniper and then a small Savin Juniper. Next are two large Silver Red-Cedars followed by a round-headed Cannart's Red-Cedar and a Chinese Juniper. Here our line ends and we must once more return to our starting point. Let us walk on the gravel path this time and there will be no confusion.

The first five trees are Chinese Junipers. The next two are

Juniperus chinensis var. **Reevesiana,** Reeves' Juniper

This form has scale-like leaves and bears female flowers and fruit. It, apparently, is a clonal variety.

Next is a Cannart's Juniper. Then comes a Chinese Juniper followed by a small Conical Chinese-Juniper (p. 121). The next two taller trees are Chinese Junipers. Next are four trees in a row, more in the center. The first is a Chinese Juniper, the second a Silver Red-Cedar, the third a Red Cedar and the fourth one Fortune's Juniper. Beyond this is a low Pfitzer's Juniper followed by a Savin.

The last tall tree, partly surrounded by the Pfitzer's Junipers along the path, is

Juniperus virginiana, the Red Cedar

This is the common Red Cedar of hillsides and woodlands in the eastern states. Specimens in the Garden, unfortunately, do not have the very characteristic and distinct conical shape which this tree assumes in the wild. It is to be found over the entire country east of the Mississippi and in parts of Canada. In some localities it is known as Savin, elsewhere as juniper and in parts of the south as cedre.

FIGURE 15. Red Cedar
Juniperus virginiana

The Red Cedar generally becomes only a medium-sized tree, though it may attain a height of 100 feet. It is most frequently found on old abandoned fields and rocky slopes, not because it prefers such sites, but because other trees crowd it from more favorable locations. Very frequently rows of these trees line fences where birds have dropped the seeds after eating the pulp of the fleshy berries.

The brittle fragrant wood of Red Cedar has long been used in a number of ways. As a protection against insects it is extensively employed in cedar chests. Its principal use is in the manufacture of pencils. Railroad ties, sills, and a host of other articles have laid claim to the wood. An extract from the fruit and leaves is used in medicine and oil-of-red-cedar, distilled from the wood, enters the making of certain perfumes.

As an ornamental Red Cedar is highly valued, especially for perpendicular effects. It is perfectly hardy and transplants well but, as so many evergreens, does not like the polluted atmosphere and unfavorable conditions of cities.

Let us now direct our attention to the trees in the wider part of this planting to the left. We shall begin with that last Silver Red-Cedar that concluded the first row and which stands as a pivotal tree at the point of the embankment. The trees are lined up in approximate rows parallel to this bank and the first row at the foot of the slope, beginning with that corner Silver Red-Cedar, contains eight trees. The first five, including the pivotal one, are Silver Red-Cedars. Then comes a lower Conical Chinese-Juniper (p. 121). The next scraggly one is

Juniperus virginiana var. **tripartita,** the Fountain Red-Cedar

This is an odd form, difficult to distinguish.

The last tree in this row is

Juniperus excelsa, the Greek Juniper

This species is native to southeastern Europe, Asia Minor, and the Caucasus, attaining heights up to 100 feet. In cultivation, var. *strictà* is better known, for it is a handsome little compact evergreen of perfectly conical form scarcely over three feet in height.

The Greek Juniper is distinguished from the American and Chinese species by having twice or thrice as many seeds in each fruit.

The four trees in the next row are all Silver Red-Cedars.

The third row begins with a Silver Red-Cedar close to the Pfitzer's Junipers. Next in the row is a Greek Juniper and beyond this two more Silver Red-Cedars.

The next row we may regard as having only two trees, both Silver Red-Cedars. The first one stands close to the Pfitzer's Junipers and the other one within the group some distance from the first one.

Next is a row of four trees. The first three tall ones are Chinese Junipers, and the next lower one is a Greek Juniper.

Now let us turn around at this last tree and consider the remaining evergreens, proceeding in the opposite direction, that is, toward the road.

The low broad and very prickly mass of evergreen that hugs the ground in a circular area is

Juniperus squamata, the Needle-leaved Prostrate-Juniper

This fine prostrate species comes from Afghanistan and high elevations in Himalaya and China. The needles are unusually sharp and masses of this juniper should make very formidable barriers against small animals.

Between this plant and the path to the left is a very small

Juniperus chinensis var. **nana,** Dwarf Chinese-Juniper

Next are two slightly bigger plants of about equal height. The one nearer the path is

Juniperus chinensis var. **globosa,** Globe Chinese-Juniper

The other one directly next to the Needle-leaved Prostrate-Juniper is a Savin Juniper (p. 111).

Next are two more trees. The narrower one to the left is

Juniperus virginiana var. **plumosa argentea,** Silver-spotted Red-Cedar

The more spreading inner one is a Greek Juniper.
The next weeping tree to the right is

Juniperus chinensis var. **pendula,** Weeping Chinese-Juniper

Straight ahead of it is another and very similar specimen. Between these two and close to the Pfitzer's Juniper is a smaller

Juniperus virginiana var. **albospica,** White-tipped Red-Cedar

Another similar specimen of almost equal height stands straight ahead of it nearer the path.

Close by between the spreading Pfitzer's Junipers and the path along the road is an upright juniper with ascending branches and needles in whorls of threes. It is

Juniperus communis, the Common Juniper

This species has the greatest distribution of any tree or shrub. In the Old World its range extends from central and northern Europe across Asia to Japan. In North America it is found wild from New England to North Carolina. Naturally we should find great variation of habit in such a widely distributed species. In valleys and lowlands it attains a height of 25 feet, on exposed hillsides it is scarcely over 5 feet tall and in the highest elevations and latitudes of its range it is very prostrate, rising only a few inches.

Because of its small size, this world-wide tree has little economic value. In India the twigs have been burned as incense and in Europe the berries have been extensively used on account of supposed medicinal properties. An essential oil may be distilled from the crushed fruits. The flavor of Westphalian hams is attributed to juniper berries, which are used with beechwood in the smoking process.

This juniper is valuable ornamentally because of its ability to thrive on limestone sites. Numerous varieties of it are known.

Returning now to the first Weeping Chinese-Juniper that we met within the group close by, we shall turn directly eastward toward the path. The first tree, incidentally the tallest here, is

Juniperus virginiana var. **Schottii,** Schott's Red-Cedar

This is a "narrow pyramidal form with bright green scale-like leaves."

Between it and the path are two smaller ones. The inner and taller one is a Silver-spotted Red-Cedar.

The low one near the path is

Juniperus virginiana var. **globosa,** Globe Red-Cedar

Now going along the path toward the road the next taller tree is a Chinese Juniper.

Then come three of

Juniperus chinensis var. **fastigiata,** Upright Chinese-Juniper

Behind these stand two Schott's Red-Cedars.

Nearer the main path is another broad Needle-leaved Prostrate-Juniper. To the east of it is a

Juniperus chinensis var. **procumbens,** Prostrate Chinese-Juniper

Seven trees remain in the apex of this corner. The next one along the main path is a Globe Chinese-Juniper.

The three similar-looking ones nearest the apex are Savin Junipers. The low broad spreading one just around the corner is another Prostrate Chinese-Juniper. The two remaining ones nearer the center of the apex are Globe Red-Cedars.

Section 2

Section 2 of the Junipers occupies a part of the eastern half of the long narrow planted area between the two roads in front of Conservatory Range 1 (Map p. 7). We shall begin at the eastern end by the path which crosses the strip from the inner road to the gateway at Southern Boulevard.

The first evergreen by the inner road and near the cross path at this point is

Juniperus virginiana var. **Keteleeri,** Keteleer's Red-Cedar

This variety is practically indistinguishable from the typical Red Cedar. It is regarded as a compact form with ascending branches.

The next two trees in a row of three that extends toward the outer road are common Red Cedars (p. 112). The other eight

trees of approximately the same size in this corner are Chinese Junipers.

The next two smaller trees of about equal size are Fortune's Juniper (p. 111).

The two very low evergreens close to the ground nearer the inner road are Needle-leaved Prostrate-Junipers (p. 115).

The next four small globular trees which are unmistakably alike are

Juniperus chinensis var. **pyramidalis,** the Pyramidal Chinese-Juniper

This is one of the most distinctive varieties in the collection. In the spring the fourth or most westerly of these four bushes has whitish- or yellowish-tipped foliage in spots and is known as *Juniperus chinensis* var. *pyramidalis variegata,* the Variegated Pyramidal Chinese-Juniper.

Between the first three of these bushy junipers and the inner road are two more Fortune's Junipers p. 111). Close by, the next taller tree with drooping foliage is a Weeping Chinese-Juniper (p. 116). Beyond it the next low-spreading evergreen with open center by the inner road and east of the lamppost is a Savin (p. 111).

Next we see several low evergreens close to the ground. The nearer one in the center and a similar plant by the inner road are

Juniperus Sabina var. **tamariscifolia,** the Tamarix Savin

This is a handsome low-spreading variety of the Savin.

The second low-creeping evergreen in the center and a similar one by the outer road are

Juniperus horizontalis var. **prostrata,** the Creeping Juniper

This name accompanied these two plants from the nursery that supplied them. The varietal name, var. *prostrata,* is unnecessary, for the Creeping Juniper is a distinct prostrate species found wild on sandy and rocky soils in southern Canada and the northern United States. Large patches of it make beautiful ground covers of bluish tint for banks or rock gardens. It is very difficult to

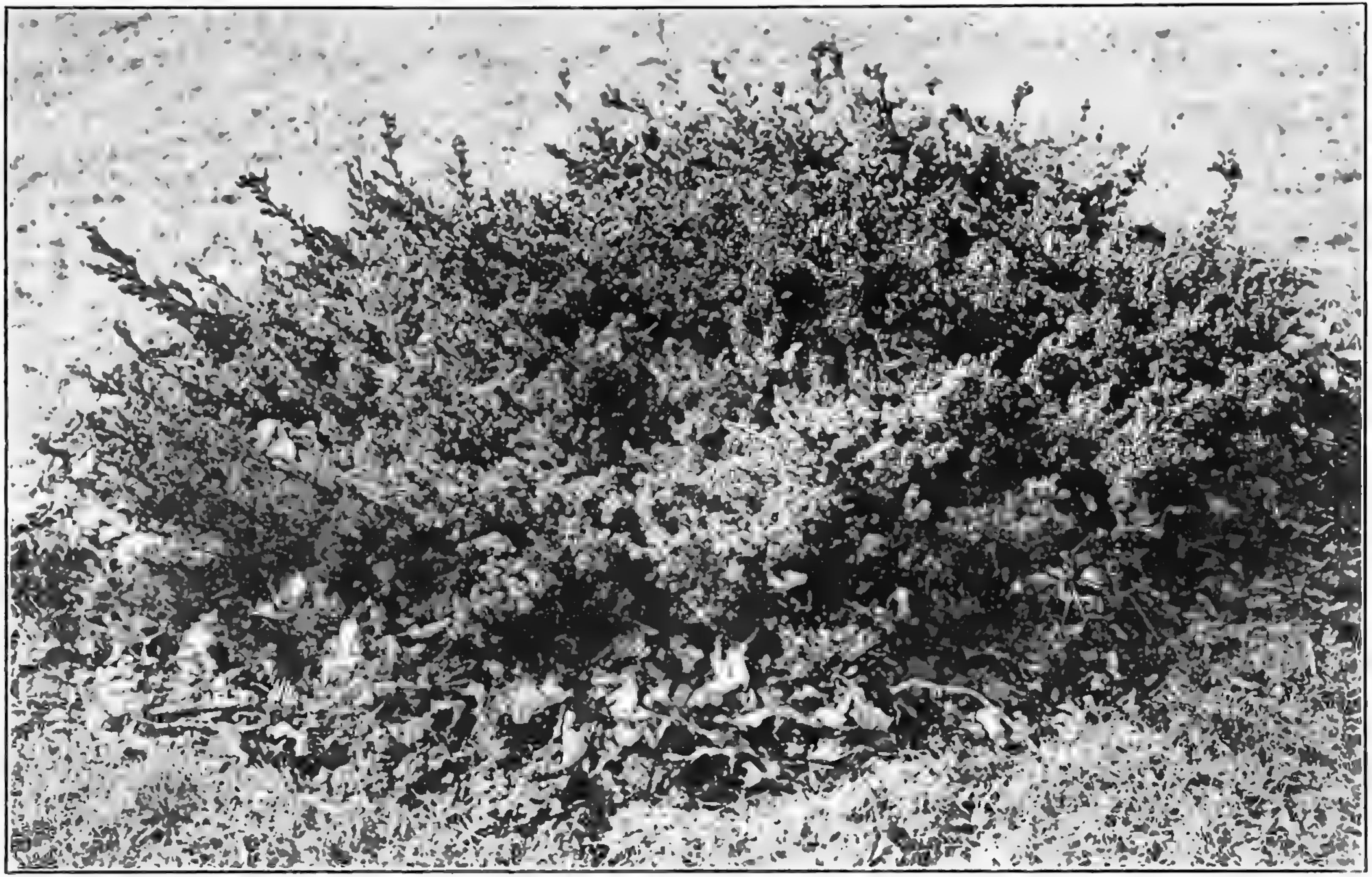


FIGURE 16. Creeping Juniper
Juniperus horizontalis

distinguish between immature specimens of various prostrate junipers, as the two which occur together here.

The distorted and somewhat Japanesque small tree nearer the outer road is unidentified.

Next are four low-spreading plants of the Needle-leaved Prostrate-Juniper (p. 115) and next to them is a large group of several Pfitzer's Junipers.

Beyond these the next evergreen by the inner road is

Juniperus chinensis var. **aurea,** the Golden Chinese-Juniper

This variety does not do well in this location. It is bright yellow in spring. Another similar plant stands directly ahead by the inner road. The two narrower and greener plants between these two are young

Juniperus virginiana var. **pyramidalis,** Pyramidal Red-Cedars

The taller tree by the outer road is a Chinese Juniper.

The small bushy plant with bluish spiny foliage near the outer road is

Juniperus squamata var. **Meyeri,** Meyer's Juniper

This is one of the most brightly colored evergreens, rivaling the Koster's Blue Spruce in spring. It is native to China.

Next we see two large Pyramidal Chinese-Junipers (p. 118). The one by the inner road is var. *variegata.* Then come several creeping forms nearer the inner road. The first of these is a Creeping Juniper (p. 118). Next to it is a Tamarix Savin, another very similar specimen of which is two paces directly ahead. The more upright bushy plant midway between these two and nearer the inner road is

Juniperus communis var. **depressa,** the Prostrate Juniper

This is a geographical variety of the Common Juniper found in eastern North America. The specimens in the collection are old and do not show the pleasing low-spreading nature of this plant.

In the center the low-creeping plant was received as *Juniperus Sabina* var. *prostrata,* which probably is the same as *Juniperus horizontalis.*

Next in the center is a Savin Juniper; to the right a step ahead is another Prostrate Juniper; the tree to the left by the outer road is probably a common Red Cedar.

Before us now are the three tallest trees in this entire Section. They are Silver Red-Cedars (p. 111). Between the last of them and the outer road the smaller tree is probably a common Red Cedar again.

Next we see five more Pyramidal Chinese-Junipers. The second and third, or middle ones, are variegated forms (p. 118).

Between the first of these five bushy trees and the inner road the low droopy evergreen is

Juniperus virginiana var. **nana pendula**

This is an odd form secured from some nursery and apparently not generally known.

Next we see five low Savin Junipers in a somewhat diagonal line running through the middle of the strip. A sixth plant stands to the right by the inner road. But east of it is an evergreen of somewhat yellowish foliage that is

Juniperus chinensis var. **aurea-variegata**

The next two tall slender trees, one beyond the other and near each of the roads are

Juniperus virginiana var. **glauca pendula,** the Weeping Silver Red-Cedar

Approximately between these two taller trees the smaller one is

Juniperus chinensis var. **neaboriensis,** the Conical Chinese-Juniper

This variety, supposedly, assumes a dense columnar form. Three more specimens stand just ahead in the center.

The taller poorly shaped tree near the inner road just before the three last-mentioned ones is a Schott Red-Cedar (p. 116).

The low flat-topped evergreen next by the inner road is a Globe Chinese-Juniper.

The next two taller trees are Schott Red-Cedars. In the middle the very small plant is a Savin Juniper.

Next by the inner road is a row of three low plants. The first is a Savin Juniper and the other two are

Juniperus chinensis var. **argenteo-variegata,** the Whiteleaf Chinese-Juniper

In the middle between these two and the outer road are two Fortune's Junipers (p. 111). Next in the center is a Silver Red-Cedar, with the upper portion of its main trunk divided into three branches. Beyond it are two more Fortune's Junipers in the center and nearer the outer road; nearer the inner road is a Variegated Chinese-Juniper. Next are two Chinese Junipers, one a few steps beyond the other and both near the outer road. By the inner road is a Chinese Juniper.

The next low-spreading plant in the center is unidentified. It appears to be a golden variety of the Chinese Juniper.

The last two junipers with slaty gray color by the inner road are

Juniperus occidentalis, the Western Juniper

This pleasing grayish-green juniper is native to the Pacific Coast from Washington to California.

General Discussion

About forty known species of junipers are distributed in the north temperate hemisphere. Without fruit they are difficult to distinguish, not only among themselves, but from closely related genera. The scales of the cones are so modified that they lose all semblance as such and form a fleshy berry-like fruit. This is the most distinctive feature of the group. The number of seeds in these berries furnishes a definite basis for distinction. In the native Red-Cedar, for instance, there are only one or two seeds and in the very similar Chinese Juniper two or three. Another distinguishing feature, almost impossible to use, is that the fruit ripens either the first year, as in the Red Cedar, or the second as in the Savin and most other species or in the third as in the Common Juniper. But since it is difficult to find berries on ornamental junipers the difficulty of distinguishing them is hardly lessened.

One distinctive feature, however, is that the juvenile needle-shaped leaves of junipers have whitish lines on their upper surface.

On allied genera these lines are on the lower surface of the needle leaves.

The junipers thrive best in sandy and loamy, moderately moist soil, but grow well on dry gravelly ground too. Limestone formation and open sunny situations are favorable. They are suited for use as hedges and windbreaks; also for seaside planting.

A few of the junipers furnish lumber for furniture manufacture and other purposes in their native countries. Oils and beverages have also been secured from the fruits.

PART 9—ARBOR-VITAE

VALUABLE ORNAMENTAL EVERGREENS

The collection of Arbor-Vitae occupies the western half of the long narrow planted strip between the two roads in front of Conservatory Range 1 (Maps pp. 7 and 57). It adjoins the collection of Junipers directly, and if we have just finished that group we can continue into the Arbor-Vitae. Otherwise we must find the very low bushy evergreen that begins the collection. It lies in the center of the strip and approximately opposite the lamppost at the eastern side of the circular drive leading to the steps of the Conservatory. Between it and the inner road is the last tree in the Juniper collection. This first Arbor-Vitae is

Thuja occidentalis var. **globosa,** the American Globe Arbor-Vitae

This is one of several compact globose forms that have been developed from the native American Arbor-Vitae. We shall see others later. They all present considerable difficulty in identification, for the characters that supposedly distinguish them are frequently very obscure. The same is true of many other forms that we shall see and this condition must be kept in mind as we consider them. The same names, both common and scientific, very frequently are applied to more than one type by various persons. The names used here have been selected as the most suitable for various reasons. They may, however, be found to differ from those used elsewhere. This, of course, applies to the entire guide.

The American Globe Arbor-Vitae forms a very dense ball-shaped evergreen, which because of its shape and limited height lends itself well to many situations.

Proceeding westward among the trees, the next upright evergreen with strikingly perpendicular branches nearer the outer road is

Thuja orientalis, the Chinese Arbor-Vitae

The Chinese Arbor-Vitae has produced quite a number of garden varieties, all of which like the tree itself are readily recognized by the distinct perpendicular arrangement of the branches and

foliage. These forms are usually known as Biota and some of them, especially the dwarf ones, are among the favorites of nursery practice.

The Chinese Arbor-Vitae is native to northern and western China, where it does not attain heights much over 40 feet.

Just beyond this tree and the outer road is another low bushy American Globe Arbor-Vitae. Directly beyond it are two more Chinese Arbor-Vitae with their characteristic perpendicular habit.

The four trees along the inner road which we have passed are

Thuja orientalis var. **aurea,** the Golden Chinese Arbor-Vitae

Here is another form where confusion of names may exist. These trees in spring have bright yellowish foliage.

The next taller and very narrow evergreen by the outer road is

Thuja occidentalis var. **pyramidalis,** the American Pyramidal Arbor-Vitae

This is merely a narrower form of the common native Arbor-Vitae, which we shall soon see.

The four larger broad trees that face us now are

Thuja Standishii, Japanese Arbor-Vitae

This is one of the most successful and best-looking of the several kinds of Arbor-Vitae in the Garden. Its heavy foliage is the most open of the species of *Thuja* and readily distinguishes it from the Chinese and the American species. It very much resembles, however, the native Western or Giant Arbor-Vitae. The difference will be pointed out when we see the latter.

The Japanese Arbor-Vitae, once common, is now one of the rarest of useful ornamental trees in Japan. In feudal times it constituted with four other conifers the famous five trees of Kiso which were strictly preserved as *Tome-Ki* (the preserved tree). The other four were the Umbrella Pine, Sawara Cypress, Hinoki Cypress and False or Hiba Arbor-Vitae. These are all in the Garden, the last in the greenhouse. In Japan this Arbor-Vitae may attain a height of 75 feet. Its wood is used to some extent.

Between the last one of these four specimens of Japanese Arbor-Vitae and the outer road stands a narrower

Thuja occidentalis, the American Arbor-Vitae

FIGURE 17. Japanese Arbor-Vitae, *Thuja Standishii;* Chinese Arbor-Vitae, *Thuja orientalis*, in left foreground.

Another tree of the same kind is next by the inner road and just east of the lamppost. This is the native Arbor-Vitae, which may be found wild in the eastern United States from Canada south to North Carolina and Tennessee. It is known under several names, among which Northern White-Cedar serves to distinguish it from the Southern White-Cedar which, however, belongs to another genus; the latter is *Chamaecyparis thyoides.* To the Indians the Arbor-Vitae was known as feather-leaf. It may attain a height of 70 feet and thrives best in low swampy land along the borders of streams.

The wood of this tree is exceedingly tough but a peculiar tendency to split along the annual rings limits its usefulness. This feature develops windshake in standing trees and is disliked by the lumberman, for he cannot make thin lumber that will hang together. The Indian, however, valued this feature, for he could easily split the wood for canoe frames.

The early settlers of New Jersey and Pennsylvania made a rheumatism ointment by bruising the leaves and molding them with lard. Drugs are still secured that are used in the manufacture of pulmonary and other medicines.

The Arbor-Vitae is very extensively used as an ornamental evergreen. It lends itself well to trimming and forms very fine dense hedges if properly cared for. Individual trees are the most commonly employed, especially to produce perpendicular effects in foundation planting.

In the center of the strip just beyond the last Japanese Arbor-Vitae are two low sprawly-looking evergreens. They are

Thuja occidentalis var. **recurvata**

This pendulous form seems to have little ornamental value. Larger plants may have some merit.

To the left of these two is an American Arbor-Vitae. Near the inner road and just on the west side of the lampost is another Japanese Arbor-Vitae. Then comes a very narrow straight and tall tree in the middle. It is a common American Arbor-Vitae.

The next three broader trees, two by the outer road and one by the inner are

Thuja occidentalis var. **aureo-variegata,** the Golden Variegated or Goldspot Arbor-Vitae

This is a variegated yellowish form of the American Arbor-Vitae.

Next by the inner road is a narrow American Arbor-Vitae and then come two low darker-colored globular bushes. Their foliage is quite different from the other kinds of Arbor-Vitae and one might not suspect them to belong here. But they are

Thuja occidentalis var. **Spaethii,** Spaeth's Arbor-Vitae

This is, perhaps, the oddest form of Arbor-Vitae in the Garden. It has two kinds of foliage, the awl-shaped juvenile type predominating. The adult scaly foliage generally found on the lower portions of the plant is very small. It must sometimes be cut out, however, for vigorous shoots of it are apt to spoil the shape of the plant. This odd variety is not quite hardy in the Garden, for the foliage generally dies every winter.

The next seven trees of varying sizes are the American Arbor-Vitae. The last of these is nearer the outer road and shows a cut stump near the base. Just beyond it and closer to the outer road is a narrow and taller Pyramidal Arbor-Vitae.

Between the last American Arbor-Vitae with the cut stump and the inner road is a

Thuja occidentalis var. **Wareana,** Siberian Arbor-Vitae

This is one of the difficultly distinguished forms. The plants in the collection have been retained under this name from nurseries which supplied them. Next nearer the inner road is an American Arbor-Vitae.

Close by in the center of the strip the tree with heavier foliage is

Thuja plicata, the Giant Arbor-Vitae

This is a very fine small specimen of one of our largest native trees in the West. Under cultivation it is quite rapid-growing and tolerant of shade.

In its range from Alaska to northern California and Montana the Giant Arbor-Vitae may attain a height of 150 or 200 feet. It is of value commercially, principally as the chief source of shingles in this country. From eight to twelve million shingles are annu-

ally produced and seventy to eighty per cent of them come from the Western Arbor-Vitae.

This is the species that is apt to be confused with the Japanese Arbor-Vitae. Close comparison, however, will show that the foliaged-branching of the latter is not so dense and that the scaly leaves end in short thick triangular points directed outward rather than in long fine free points parallel to the twig.

The next lower tree a bit to the right is

Thuja occidentalis var. **spiralis,** the Spiral Arbor-Vitae

This is one of the distinct forms in the Garden, characterized by the twisted arrangement of the dense foliage fronds.

The next two bushy evergreens by the inner road and one by the outer road are American Globe Arbor-Vitae.

Scattered over the area before us now are nine small trees which in spring stand out very conspicuously by their bright yellowish foliage. They are

Thuja occidentalis var. **lutea,** the Golden Peabody Arbor-Vitae

This is one of the finest forms in this Garden. Throughout the summer it is brilliantly yellow.

The next four darker trees with shorter and somewhat twisted foliage are the Spiral Arbor-Vitae. Two are along the outer road and the other two in the center close to the last of the Golden Peabody Arbor-Vitae. A fifth one we have passed by the outer road near the first Golden Peabody Arbor-Vitae.

The next broader tree by the outer road, whose center has been removed, is

Thuja occidentalis var. **alba,** the White-tipped Arbor-Vitae

This variety has white-tipped foliage during a portion of the summer. Otherwise it is indistinguishable from the common form.

Between it and the inner road is

Thuja occidentalis var. **elegantissima**

This is another yellowish form. A second specimen stands next beyond and more in the middle.

To the left of this last is an American Arbor-Vitae and to the right is

Thuja plicata var. **atrovirens,** the Dark Giant Arbor-Vitae

This variety of the Giant Arbor-Vitae has darker foliage than the species itself. A second specimen stands directly ahead, beyond a lower one which is intervening. The latter is

Thuja occidentalis var. **pumila**

This is one of the many small forms, a second specimen of which is straight ahead just beyond the last Dark Giant Arbor-Vitae.

The next narrow evergreen in the center is an American Pyramidal Arbor-Vitae. The next by the outer road is

Thuja occidentalis var. **Rosenthalii,** Rosenthal's Arbor-Vitae

Another difficultly distinguishable form.

Next to the right is a group of seven American Globe Arbor-Vitae. Between them and the outer road is a common Arbor-Vitae, beyond which and still closer to the outer road is a

Thuja occidentalis var. **sempervirens**

A yellowish form.

The next two trees more in the middle are

Thuja occidentalis var. **Douglasii pyramidalis,** Douglas Pyramidal Arbor-Vitae

This is quite a fine variety of dense pyramidal form with densely branched fern-like branches.

The next one near the outer road is another *Thuja occidentalis* var. *sempervirens.*

The two rather large trees by the inner road are the American Arbor-Vitae and between them a tiny globular evergreen is

Thuja occidentalis var. **Little Gem**

This is considered by some to be identical with *Thuja occidentalis* var. *pumila.*

The next two larger trees nearer the outer road are American Arbor-Vitae and in the center in a somewhat diagonal line are three of the very narrow Pyramidal Douglas Arbor-Vitae. To the right of the last of these and to the left of it a pace ahead are two of the common Arbor-Vitae.

Along the inner road we now see fourteen low and for the most part globular plants. These are a mixture of *Thuja occidentalis globosa, T. occidentalis globosa nova, T. occidentalis nana* and

T. occidentalis Booth's Dwarf. Here we see a variety of these forms already referred to that are very similar to one another.

The next larger and broader tree in the middle after the last American Arbor-Vitae is a Variegated American Arbor-Vitae. Another specimen of it is directly ahead, also in the middle, and a third stands to the left by the outer road, and between these two.

The next two larger and broader specimens, one in the middle and the other by the outer road, are the American Arbor-Vitae. Now we come to a group of eight yellow-foliaged evergreens. They are Golden Peabody Arbor-Vitae (p. 129). The next two darker-colored trees, one in the middle and the other with an open center by the other road, are the Spiral Arbor-Vitae. Next in the center the slender-foliaged and thready looking tree is

Thuja occidentalis var. **filiformis,** Threadtwig Arbor-Vitae

This odd form has very slender branches.

The next ten trees are the Japanese Arbor-Vitae (p. 125).

Beyond them stands a large American elm and on the other side of it are the last specimens of Arbor-Vitae. The first one on the left near the outer road is a Spiral Arbor-Vitae (p. 129). The first in the middle is a Siberian Arbor-Vitae (p. 128). Of the next two, nearer the outer road, the outer one is a George Peabody Arbor-Vitae, and the inner is a common Arbor-Vitae. There remain now six small trees. The three nearest the cross walk are the American Globe Arbor-Vitae and the other two low bushy ones are Siberian Arbor-Vitae. The remaining small slender one by the outer road is the common American Arbor-Vitae.

General Discussion

The species of Thuja are all evergreen cone-bearing trees. There are six different known kinds. Two are not represented in the Garden, *viz.*: the Korean Arbor-Vitae, *T. koraiensis,* found in Korea, and *T. setchuensis* of western China. The last is not in cultivation. The foliage of these trees resembles that of the cypress, *Chamaecyparis,* in the flat, scaly divided branchlets and the leaf arrangement. There is apt to be confusion at times in this respect. But the cones are markedly different, though not

frequently present on ornamental material. Those of *Chamaecyparis* are globular and the scales composing them are shield-shaped while those of Thuja are egg-shaped or ovoid and their scales are flat.

The forms of Arbor-Vitae are very valuable ornamentally, for they are among the leading evergreens that may be used to secure perpendicular effects. Some of them, as the common native species, are well suited for hedges and lend themselves admirably to trimming.

Commercially, the Giant Arbor-Vitae is the most valuable, as the main source of shingles in this country. The native eastern species has been used to some extent for various minor industries.

These trees thrive best in somewhat moist loamy soil and are easily transplanted.

PART 10—BALD CYPRESS

TREES OF UNUSUALLY DURABLE WOOD

The collection of Bald Cypress occupies the eastern end of the long narrow planted area between the two roads in front of Conservatory Range 1. The collection is located on the west side of the main drive after it enters the Garden from Southern Boulevard and opposite the Ginkgos and beginning of Section 1 of the Pines (Map p. 7). Nine trees constitute the group. They are

Taxodium distichum, the Bald Cypress, and
Taxodium ascendens, the Pond Cypress

These are the only conifers we have encountered so far in our Guide that are not evergreen. They lose their leaves in the winter and secure new ones each spring. Only three other genera of conifers, two of which we shall meet later, do this. They are *Larix,* the Larch, *Pseudolarix*, the Golden Larch, and *Glyptostrobus*. The peculiar feature about this habit in the bald cypress is that not only the delicate leaves are lost, but the slender twigs that bear them fall off, carrying the leaves along.

In the Bald Cypress these delicate leaves stand out in one plane from two sides of the twigs. In the Pond Cypress, however, the leaves are tiny and scale-like, closely pressed against the twigs, which tend to stand erect. The result is a pronounced contrast in the general appearance of the two trees.

The Bald Cypress is not frequently seen in cultivation, though it has proved hardy as far north as Massachusetts and has been known to withstand temperatures twenty degrees below zero. It is one of the best trees for wet situations, though it thrives in ordinary soil. Its fine feathery foliage, particularly the new growth in spring, is very attractive.

The Bald Cypress is a native of the southern United States, where it grows in swampy lands from Delaware to Florida and west to southern Illinois, Oklahoma, and Texas. It is the tree that has given its name to the famous and possibly uncanny Cypress swamps of the South, where it may reach a height of 150 feet.

FIGURE 18. Bald Cypress
Taxodium distichum

The most interesting feature of the Bald Cypress is the development of the so-called cypress "knees." In situations where the roots of these trees are permanently or periodically under water, soft woody growths up to ten feet in height found on the submerged roots project above the surface of the water. These growths later become hollow. There has long been a question concerning the function of these "knees." It is generally believed that they assist in supplying atmospheric oxygen to the submerged roots. This explanation is based on the observations that these growths form only when the roots are submerged, that their size depends on the depth of the water and that if they too become covered with water the trees die. On the other hand it has been maintained that the hardened surface of these knees could not absorb oxygen, and that if such were the case nature would provide a broader rather than a narrowing surface of limited area for absorption. Root anchorage has seemed the function from this viewpoint. They serve no reproductive purpose, for they have no buds and die when a tree is cut.

The fact remains, however, that among trees adapted for swamp growth, Bald Cypress is the only one that thrives in soil continuously flooded. Fifty or a hundred of these knees may surround the base of the tree, extending some distance from the trunk. In addition to the "knees," the base of the tree generally has large flutes or buttresses in wet situations. Mature trees are usually hollow at the base.

The wood of the Bald Cypress is very durable, as might be expected, and has been much advertised as the "Wood Eternal." Under wet conditions the trees may attain enormous diameters, whose proportion to their heights may exceed that exhibited by the gigantic Sequoias of California.

Furthermore, the Bald Cypress displays an anomaly among conifers by sending up vigorous sprouts from cut stumps. This departure, as has already been noted, is exhibited in the Pitch Pine and Redwood.

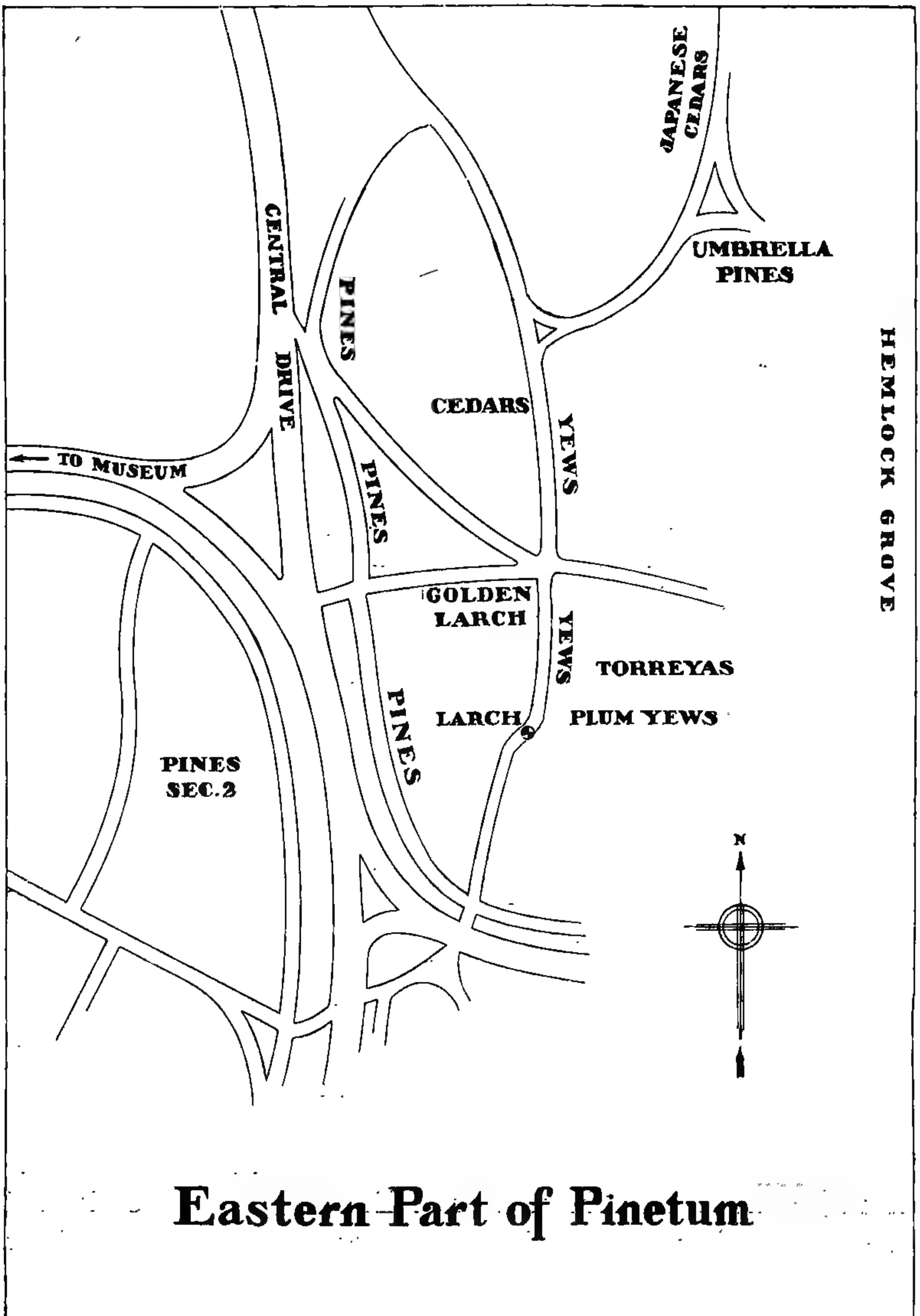
General Discussion

There are only two or three kinds of Bald Cypress, the number depending, as in all such cases, on the definition of a species.

They are all confined to North America. The third one, not in the Garden, is the Montezuma Cypress of Mexico, *Taxodium mucronatum*. The leaves of the last-named tree may be deciduous, semi-evergreen or evergreen according to situation. Evergreenness is induced, naturally, by optimum conditions. This tree was long reverenced by the Indians before the discovery of America by Europeans. It is not hardy, though occasionally planted in California. It is interesting, since it may attain a height of 170 feet with a trunk 40 feet in diameter. A certain very large tree of this kind in Mexico City has been regarded as possibly the oldest living tree in the world, rivaling the Redwoods of California. Our native Bald Cypress may commonly be found 400 to 600 years of age and occasionally from 720 to 1200 years. It is remarkable that trees living in such wet situations should attain such age.

Some botanists regard all these trees as varieties of one species. The differences, it is said, are more geographical than botanical. The Pond Cypress, it is claimed, is the result of less fertile conditions. It is usually confined to the prairies and low pinelands and may even occur on sand dunes. The peculiar appressed nature of the leaves clinging close to the twigs may, consequently, be an adaptation to prevent excessive evaporation of moisture under these drier conditions. The Bald or River Cypress, on the other hand, demands wetter situations. Occasionally both types of leaves, the wide spreading and the closely pressed, are found on the same tree.

One or two very similar trees are found in China and are known as *Glyptostrobus heterophyllus*. This is little known in cultivation outside of China and is unknown in the wild state. Several specimens have been cultivated at the Garden in the conservatories. Very commonly, however, this relatively rare plant is regarded as a *Taxodium*. It resembles the Bald Cypress very closely but it loses its cone scales rather than retaining them as in the native trees. This is the principal basis of distinction, similar to that between the Douglas Fir and true firs. Fossil relatives of both *Glyptostrobus* and *Taxodium* have been found from widely separated regions.



Eastern Part of Pinetum

PART 11—LARCHES

CONIFERS THAT LOSE THEIR LEAVES

The collection of Larches is located on the ridge between the Central Drive through the Garden and the open meadow to the east of it (Map p. 137). Let us locate ourselves at the curve in the path, as indicated on the map. Two small larches are located on the south side of this point. They are the only two trees there with flat needle-like leaves in clusters. In winter they are bare, but their branchlets are covered with many regular short spurs.

The nearer of these two trees is a European Larch, and the farther one is a Japanese Larch. The latter may be distinguished by the two white stripes on the lower side of the leaves, which are less conspicuous on the European species. More of these trees stand on the north side of the curve in the path.

In considering the larches we meet the second kind of coniferous trees that lose their leaves in the autumn. The first case was that of the Bald Cypress and the third and last will be the Golden Larch.

As we proceed through the group on the north side of the curve in the path the first two trees are

Larix Larix, the **European Larch**

This is a valuable tree of rapid growth for parks and large private estates. It is hardly suitable for small areas because of its tall habit and deciduous nature. It does well in sandy soil.

The European Larch is distinguished from its Japanese relative by its grayish bark and leaves that are green rather than bluish green. The scales of the cones are not curved at their tips. It has a very wide distribution from the Alps of central Europe to northern Russia and Siberia and attains a height of 140 feet. It is one of the leading timber trees of Europe and its wood is used in a great variety of industries. The trees are extensively used for forestation purposes in Europe, particularly in England.

The bark has astringent and other medicinal properties and has also been used in tanning and dyeing. An oleo-resin known as Venice or Larch Turpentine is obtained by tapping the trees in

Europe. It is similar to our native balsam (p. 79) and possesses medicinal qualities. Its use, however, is more or less confined to veterinary practice. A substance called Briancon Manna or Manna of the Larch exudes from the leaves in summer. It is sweet and was formerly used in medicine. Ethyl alcohol may be obtained by distillation of the wood.

The next trees ahead are

Larix leptolepis, the Japanese Larch

This tree attains a height of 80 feet and more in Japan and is regarded as one of the handsomest and most rapidly growing of the genus. It occurs there on the slopes of high volcanic mountains at elevations of 4000 to 6000 feet. The wood is hard and durable and is used there for general construction purposes. In this country it is perhaps the best of the larches for a lawn specimen.

The Japanese Larch, as already pointed out, is distinguished from the European kind by its more prominent whitish lines on the under side of the leaves which give the foliage a bluish-green tint. Furthermore, the cone scales are broader and bent at their tips.

Just north of these tall Japanese larches are two young trees. They are

Larix eurolepis, the Dunkeld Larch

This is a hybrid that first appeared in England as a cross between the common European and the Japanese Larches. It possesses characters of both its parents and seems to be more vigorous than either of them. It is not well known in this country yet.

The three evergreens on the western edge of this Section are Red Cedars (p. 112).

General Discussion

There are about a dozen different kinds of larch, all inhabitants of the colder regions and higher altitudes of the Northern Hemisphere. They are all deciduous conifers and only one species, *Larix*

Griffithi, from the Himalayas, is tender. No other tree extends farther north than the larch, which in America reaches 67° latitude and in Siberia 72°, both within the Arctic circle. The only other conifers approaching this are the Jack Pine and the Common Juniper.

The wood is much used, being hard, heavy, and very durable. That of *Larix occidentalis* is regarded as the best of all American conifers. From the European Larch turpentine is obtained, though the Maritime Pine is the chief source in Europe. The bark of larch has furnished some tannin extract. The larch is widely tolerant as to soil, growing on both clay and limestone, and preferring a somewhat moist but well-drained soil and an open situation. The American Larch, *Larix laricina,* thrives even in swamps.

As in the true cedars, *Cedrus,* the branchlets of the larch are of two kinds. There are elongated slender ones which grow up to two feet a year and bear leaves distributed singly or spirally. The others are the short spurs that bear clusters of leaves. The larches are intolerant of shade and demand full light. Several insect and fungous pests are serious drawbacks to the cultivation of larch.

PART 12—GOLDEN LARCH

Three trees constitute the collection of Golden Larch in the Garden. They stand just north of the Larches on the higher ground east of the Central Drive through the Garden (Map p. 137). These trees are

Pseudolarix Kaempferi, the Golden Larch

This tree is very similar to the true larches. Its long spreading branches are pendulous at the tips, clothed in summer with light-green clustered leaves that turn clear yellow in fall. It, too, loses its leaves in autumn, being one of the four genera of conifers that do so. The others are the Larch, the Bald Cypress and *Glyptostrobus* of China. The Golden Larch is very similar to the true larches but differs by having stalked, pendulous, clustered male flowers and cone-scales which fall from the axis of the cone at maturity as in the true firs. Furthermore, the Golden Larch is distinguished by its longer club-shaped short shoots with distinct annual rings and by its larger and broader leaves.

The Golden Larch is found wild only in a restricted region in eastern China, at altitudes of 3000 to 4000 feet. It attains heights there up to 130 feet. In our country it is quite hardy, though slow growing, and is apparently free from insect pests and fungous diseases. It requires a sunny position, well-drained moderately moist soil, and it dislikes limestone.

To the Chinese this tree is known as *chin-lo-sung, i.e.,* Golden Deciduous Pine, or merely as *ching-sung, i.e.,* Golden Pine. The names, of course, refer to the golden color displayed by the foliage in autumn. It is too scarce to be of much economic value, though the wood is of good quality and easy to work.

This is the only species in the genus *Pseudolarix.*

PART 13—YEWS

THE WOOD OF ENGLISH YULETIDE AND MEDIAEVAL ARCHERY

VALUABLE ORNAMENTAL EVERGREENS

The collection of Yews is located on the east slope of the ridge between the Central Drive through the Garden and the narrow open meadow to the east of it (Map p. 137). We shall begin at the southern end of the collection and proceed northward along the path.

The first upright yew on our right close to the exposed rocky formation at the curve in the path is

Taxus cuspidata var. **pyramidalis,** Pyramidal Japanese-Yew

This is an example of varietal possibilities in horticultural practice. This particular variety is not generally recognized but the tree at hand was received from a nursery under this name. It probably arose from a cutting taken from the terminal growth of a Japanese Yew for such cuttings are known to produce upright plants. Side cuttings generally form spreading plants.

Next is a lower, bushier, and broader yew. It is

Taxus baccata var. **aurea,** the Golden English-Yew

This is a distinct variety of the English Yew. Its leaves are golden yellow in early summer, later losing their brilliance. This variety may at first be confused with the somewhat similar Variegated English-Yew which we shall soon meet. Distinctions will then be noted.

The next lower and very dense evergreen that covers the ground beneath it is

Taxus baccata var. **repandens,** the Spreading English-Yew

This is a very attractive form that lends itself well to many situations. It has graceful drooping foliage and forms a very dense growth close to the ground, only a foot or so in depth. Its leaves seem unusually long for an English Yew and resemble those of the Japanese. But the low weeping habit of the plant betrays it.

Directly behind this is a small but upright form that does not lie on the ground. It is

Taxus baccata var. **fastigiata,** the Irish Yew

This is one of the best-known varieties of the English Yew. It is always a female plant, for, unlike the pines, the sexes are different individuals in the yews. And the Irish Yew originated over a hundred years ago from a female plant. All Irish Yews since are direct descendants of that original tree. Some very handsome specimens are known in Europe.

The next large and wide-spreading evergreen along the path, as well as all the other similar ones in the background, is

Taxus baccata var. **variegata,** the Variegated English-Yew

This variety is very apt to be confused with the Golden English-Yew until one has carefully compared them. The Golden English-Yew is stiffer, the branches do not arch and project so much and in summer the color of the foliage is deeper yellow. That of the Variegated English-Yew grows pale toward the end of the summer. The variety before us makes a very dense growth and seems admirable in a protected spot as a border hedge where ample room is given it.

The next lower dense one along the path is another Spreading English-Yew.

The next very wide-spreading plant, with stiffer branches and more stubby foliage, is

Taxus cuspidata var. **nana,** the Dwarf Japanese-Yew

There are only two or three varieties of the Japanese Yew and this is probably the best known of them. It is a rather stiff low-branching and wide-spreading form, with shorter and stubbier leaves than we shall find on the Japanese Yew itself. It needs plenty of room to develop properly and is perhaps best used singly because of its individuality. A very similar variety that is difficult to distinguish from the one before us is var. *densa*. A very handsome example of this latter is located by itself in the center of the driveway in front of Conservatory Range 1.

Next along the path is another wide-spreading Variegated English-Yew. Behind it the largest tree in the entire group is

Taxus cuspidata, the Japanese Yew

The Japanese Yew has during recent years become one of the favorite ornamental evergreens. It has superseded the more famed English Yew because of its greater hardiness and reliability. It is very commonly used as a hedge plant and in this capacity a low-spreading form is employed that is secured by cuttings from lateral branches of plants. If the upright terminal shoots are rooted upright plants result. The reddish berry-like fruits of the yew are an ornamental asset but to insure their production male and female trees must be planted together. The yews, like the hollies, do not as a rule have both sexes of flowers on the same plant as in the pines and spruces.

The Japanese Yew is native to Japan, where from time immemorial it has been used for ornamental purposes. It attains a height there of 50 feet. The tough, close-grained and beautifully colored wood has been used for cabinet work and indoor decoration. The Ainos, the aboriginal inhabitants of the island of Yeso, made their bows from the Japanese Yew as the archers of Europe did from the tough English Yew.

The Japanese Yew is most readily identified by the two-ranked leaves, which stand up on the twigs forming a V-shaped trough. The leaves of the English Yews do not show this so conspicuously and, furthermore, are not yellowish on the under surface.

Next along the path is another Dwarf Japanese-Yew and behind it a large wide-spreading Variegated English-Yew. Behind this the taller green yew with wide base is a Japanese Yew. The two tall narrow evergreens behind these last yews are Red Cedars (p. 112).

Now we see a few very small yews. The first one to the right close to the bigger Variegated English-Yew is

Taxus baccata var. **fastigiata aurea,** the Golden Irish-Yew

This is a yellow form of the Irish Yew. It may attain a height of six or ten feet.

To the left of it the small plant nearer the path is a Japanese Yew and the narrower one behind it is an Irish Yew.

Next near the path the tallest of these small forms is

Taxus cuspidata var. **Hicksii,** Hicks' Yew

This is an upright form of the Japanese Yew developed and sold by the Hicks Nurseries on Long Island. The specimen at hand is rather poor.

The two remaining small plants and the third similar one close by very much resemble English Yews in their foliage and are apt to be confusing. They were raised, however, from seed secured from Japanese Yews in the Garden.

Now we come to larger plants. The broad bushy one with yellowish foliage in the background is a Golden English-Yew.

This specimen shows the features of this variety very well in contrast with the Variegated English-Yews we have passed.

The next larger one along the path is a Japanese Yew and to the left of it is another low spreading stiff Dwarf Japanese-Yew. Directly behind this last one is a tree with drooping branches. It is

Taxus baccata var. **Jacksonii,** Weeping English-Yew

This is a handsome weeping form of the English Yew.

The last three trees along the path are Japanese Yews.

Let us now turn down the path to the right. Three low dense yews come into view, which are

Taxus baccata var. **procumbens** or **repandens,** Prostrate English-Yew

It is difficult to tell which of these two varieties the plants at hand are. This applies as well to previously encountered specimens of the Prostrate English-Yew. The distinction is of little significance.

Behind them the remaining stiff wide-spreading form is another Dwarf Japanese-Yew.

On the north side of the path we are now on are several more yews. The tallest one is a Japanese Yew. The yellowish- or brownish-tinted plants to the right of it with slender projecting branches are Variegated English-Yews. The five lower and stiffer forms remaining before us present some difficulty in an attempt to

distinguish them. Some of them appear to be Dwarf Japanese-Yews and the others probably are

Taxus baccata var. **adpressa**

This is a female clonal variety whose leaves are shorter and broader than in the common form.

Let us continue northward along the path on the western side of this group of yews. The corner plant is probably *Taxus baccata* var. *adpressa.* Then comes the larger Japanese Yew already pointed out and next to it three Dwarf Japanese-Yews. The Variegated English-Yews already noted are now in the background. The small but upright yew directly beneath the big overshadowing tulip tree as well as the last three low spreading forms with wide projecting branches to the left are Japanese Yews.

The three remaining more upright but poorer-developed plants are

Taxus baccata var. **Dovastonii,** the Dovaston Yew

These plants have been set out under this name but fail to show much character. It is a variety supposedly marked by an erect stem and horizontal wide-spreading branches with long weeping branchlets.

In order to see all the yews in the collection, let us retrace our steps a bit and find the extreme southern end of the collection on the eastern side. In other words, we must locate the southeast corner of all the evergreens that are here grouped together. At that point we shall stand in a little protected opening almost completely surrounded by evergreens. A rocky ledge marks the western side outside the trees. Once there we should notice the large, low, and wide-spreading evergreen with distinctly weeping effect. It is another Weeping English-Yew. To the left of it, as we regard it from within our little enclosure, are two taller trees. The center one is a Japanese Yew and the less rigid one to the left of it probably is

Taxus baccata, the English Yew

The English Yew has long been one of the venerable trees of Europe, particularly in England. The Yule log of olden days

came from it and its part in English lore has been considerable. Before the advent of Christianity in England the yews were sacred to the pagan Druids, who erected their temples near these trees. In horticultural work it formerly played a greater part than at present and the topiary effects that were secured with the yew were remarkable. We cannot afford to enter into the interesting history of this tree here. The wood has been highly prized for cabinet work and in olden days made the bows of the archers. The foliage of the yew is said to be poisonous to cattle, but the little red berry-like fruits are edible.

In this country the English Yew is not so hardy as the Japanese. A great many garden varieties are cultivated.

The English Yew is found wild over most of Europe and in northern Africa and western Asia.

On the eastern side of our little enclosure are three evergreens. The lower upright bushy one in the center with golden foliage during summer is a Golden English-Yew.

There remain four unmentioned evergreens in this enclosure. They are not yews, though similar to them. They are Plum Yews and Torreyas.

General Discussion

Six or eight different kinds of yew are known, found only in the Northern Hemisphere. They are all evergreens, so closely related that they are often regarded as geographical varieties of but one species. They do not differ in fruit, only in characters of bud, leaf and habit. Three occur wild in the United States. The Canada Yew, *Taxus canadensis,* is found throughout most of the Northeast, where it is frequently known as Ground Hemlock. It forms bushy masses up to four feet or more in height and is the hardiest of the yews. But it has the habit of turning a sickly brown in autumn and that feature discourages its ornamental use. The Western Yew, *T. brevifolia,* forms a tree up to 75 feet in height on the Pacific Coast, but is rare in cultivation. In Florida there is the Florida Yew, *T. floridana,* a small tree of minor value. Others occur in Asia. A few hybrids and several other forms have been produced in cultivation.

PART 14—PLUM YEWS

The collection of Plum Yews contains three small plants which stand close to the yews on their eastern side (Map p. 137). See text, last page.)

In the enclosure where we considered the last of the yews there remained unmentioned four evergreens. One of these is the small very low one close to the ground on the western side. Another is next to it and upright. Both are

Cephalotaxus drupacea, the Japanese Plum-Yew

A third small specimen of this same kind is located about fifty feet farther north on the eastern edge of this entire collection of evergreens.

This evergreen from Japan usually forms under cultivation a shapeless wide-spreading bush. It has an almond-like fruit from the seed of which a resinous oil is pressed by the Japanese for use in lamps. The wood occasionally is employed in cabinet-making. To the Japanese this bushy tree is known as *Inu-gaya*, *Abura-gaya*, and as *Anatni*. It is not frequently found in cultivation.

General Discussion

There are six kinds of Plum Yews, all native to Japan, China, or Himalaya. They are ornamental evergreen shrubs and require shelter in cold climates as that of New York. They closely resemble the yews but differ from them in having whitish lines on the under side of the leaves rather than a yellowish-green color. From the Torreyas, which we shall see next and which also are yew-like, they differ by these whitish lines being broader and not narrower than the green lines that accompany them.

PART 15—TORREYA

The collection of Torreyas consists of four trees of one kind located on the eastern side of the yews (Map p. 137). See text, last page of yews).

In considering the last of the yews, we noted three trees on the eastern side of the little evergreen enclosure where we were located. The center lower bushy one was a yew. The other two taller ones at the sides of it are

Tumion nuciferum, the Japanese Torreya

The other two trees of this kind are located about thirty-five and forty feet north of these two and on the eastern side of this entire evergreen collection. The very much smaller Plum Yew forms a triangle with these two.

This tree is the largest of its genus, attaining a height of 80 feet in Japan, but more often it is only a shrub 20 feet tall. It is known to the Japanese as *Kaya.* An oil, *kaya-no-abura,* is extracted and considerably used for cooking in Japan. The kernels of the seeds, which possess an agreeable and slightly resinous flavor, are used as food. The wood is valued for shipbuilding and cabinet-making.

General Discussion

There are four different known kinds of *Tumion* or *Torreya.* Two of these are native. They are *Tumion taxifolium,* the Stinking Cedar of Florida, and *T. californicum,* the California Nutmeg of California. The former, often called Chattahoochee Pine, grows on limestone soil and like the Florida Yew is confined almost wholly to one county. It reaches a height of 50 feet and its wood has some local value. The bruised leaves and branches give off an odor suggesting its common name. This same feature is found in the California Nutmeg, whose seeds resemble nutmegs. The fourth species is *Tumion grande* of China, where it is usually a shrub but may become a tall tree.

These Torreyas are interesting principally because they represent only a few isolated spots on the earth, Florida, California, China, and Japan. They are remnants of more abundant vegetation in

earlier geological periods. They very closely resemble the yews and are characterized by opposite spreading ranks of firm sharp leaves terminated by a fine hard point. The leaves of the yews, however, are spirally arranged but by a twisting of the stalks appear to be two-ranked. Furthermore, the under surface of the leaves in the yews, especially the Japanese, are yellowish and not whitish. And from the Plum Yews the Torreyas are distinguished by these whitish lines being narrower than the green lines that accompany them.

PART 16—CEDARS

THE TREE OF SOLOMON'S TEMPLE

Three genera of evergreens are commonly known as cedars. The common Red Cedar (p. 112) is really a juniper. The White Cedar (p. 106) is a *Chamaecyparis*. The Arbor-Vitae and the Cedrela are often known as cedar, too. The true cedars are those of the genus *Cedrus*. The collection of these in the Garden has only three trees, which stand on the higher ground east of the Central Drive through the Garden (Map p. 137). They are north of the yews and on the west side of the path from them.

The three trees here are

Cedrus atlantica var. **glauca,** the Blue Atlas-Cedar, and

Cedrus atlantica var. **aurea,** the Golden Atlas-Cedar

The former, of which there are two trees, has bluish foliage, and the latter, of which there is one tree, has golden foliage. These color features show best on the new growth in spring. The first of these is a natural variety that may occur in any batch of seedlings. Consequently, there are gradations in it. The golden form is propagated only by grafting and is not so vigorous as seedling trees.

The Atlas Cedar, of which these are two variations, is native of the Atlas Mountains in Algeria and Morocco of northern Africa. It grows there up to 120 feet in height, forming a very handsome tree, pyramidal when young and flat-topped in age.

These trees prefer well-drained, loamy soil, but will also grow in sandy clay, if there is no stagnant moisture.

General Discussion

There are three closely related species of true cedar and these are sometimes regarded as geographical varieties of the same tree. Of these the Lebanon Cedar is one of the most famous of trees, because of its interesting historic and religious associations. The Cedars of Lebanon that grew near the eastern shores of the Mediterranean Sea have been famed throughout history as the source of the great timbers which Solomon secured from King

Hiram for his great temple. Much interesting matter has been written about them which cannot be discussed here.

The third is the beautiful Deodar Cedar of India. Like the Atlas and Lebanon Cedars, this one, too, exhibits a conspicuous flat-spreading top in old age but has a broad pyramidal form when young. Though possibly the most beautiful of the cedars, the Deodar is the tenderest. Consequently efforts to raise it in the Garden have failed. In Pasadena, California, there is a certain avenue that was lined with these trees half a century or so ago. Today they constitute the finest display of these trees in this country, for they have become magnificent specimens fifty or sixty feet high. Every Christmas they are illuminated and are the pride of the land about them.

The cedars are evergreen trees, differing in that respect from the larches, which they closely resemble in foliage. Both have numerous needle-like leaves borne in clusters. Though this applies also to the pines, there is little chance for confusion if one compares them but once.

PART 17—UMBRELLA PINE

A CURIOUS TREE FROM JAPAN

The collection of Umbrella Pines is located at the extreme northern end of the open meadow that borders the Hemlock Grove on its western side (Map p. 137). These trees are

Sciadopitys verticillata, the Umbrella Pine

This is one of the most distinct of conifers. It is not a pine and has no immediate relatives. It is the sole survivor of a prehistoric group of plants whose other members were exterminated in a remote geological period.

The Umbrella Pine is an evergreen tree, a native of Japan, where it attains heights from 70 to 120 feet and diameters up to 10 feet. It is common in some parts of Japan and the timber is a regular article of commerce. The durable wood is used for boats, bathtubs, etc. The fibrous bark is made into oakum, used for caulking boats and packing steam-pipe joints.

To the Japanese this tree is known as *Koya-maki,* which means the Podocarpus of Mt. Koya. Podocarpus is another kind of tree found in Japan, specimens of which are growing under glass in the Garden. Like the Ginkgo, Sciadopitys was for a long time known, ornamentally, only in temple gardens near the ancient monastery town of Koya. It is not, however, as popular as the Ginkgo and is not extensively planted in Japan.

Under cultivation the tree is very hardy but slow-growing. It requires some shelter from strong winds and enjoys cool moist situations. Reproduction is accomplished by seeds borne in cones.

The odd feature of the Umbrella Pine is the production of two kinds of leaves. The conspicuous foliage at the tips of the branches resembles the ribs of an umbrella and has given the tree its common name. But these are not true leaves or needles as on other conifers; they are modified stems and have been known to branch. The true leaves are very small and occur at the base of each of these larger rib-like structures known as phyllodes. The possession of these two kinds of leaves makes the Umbrella Pine one of the most curious and interesting of trees.

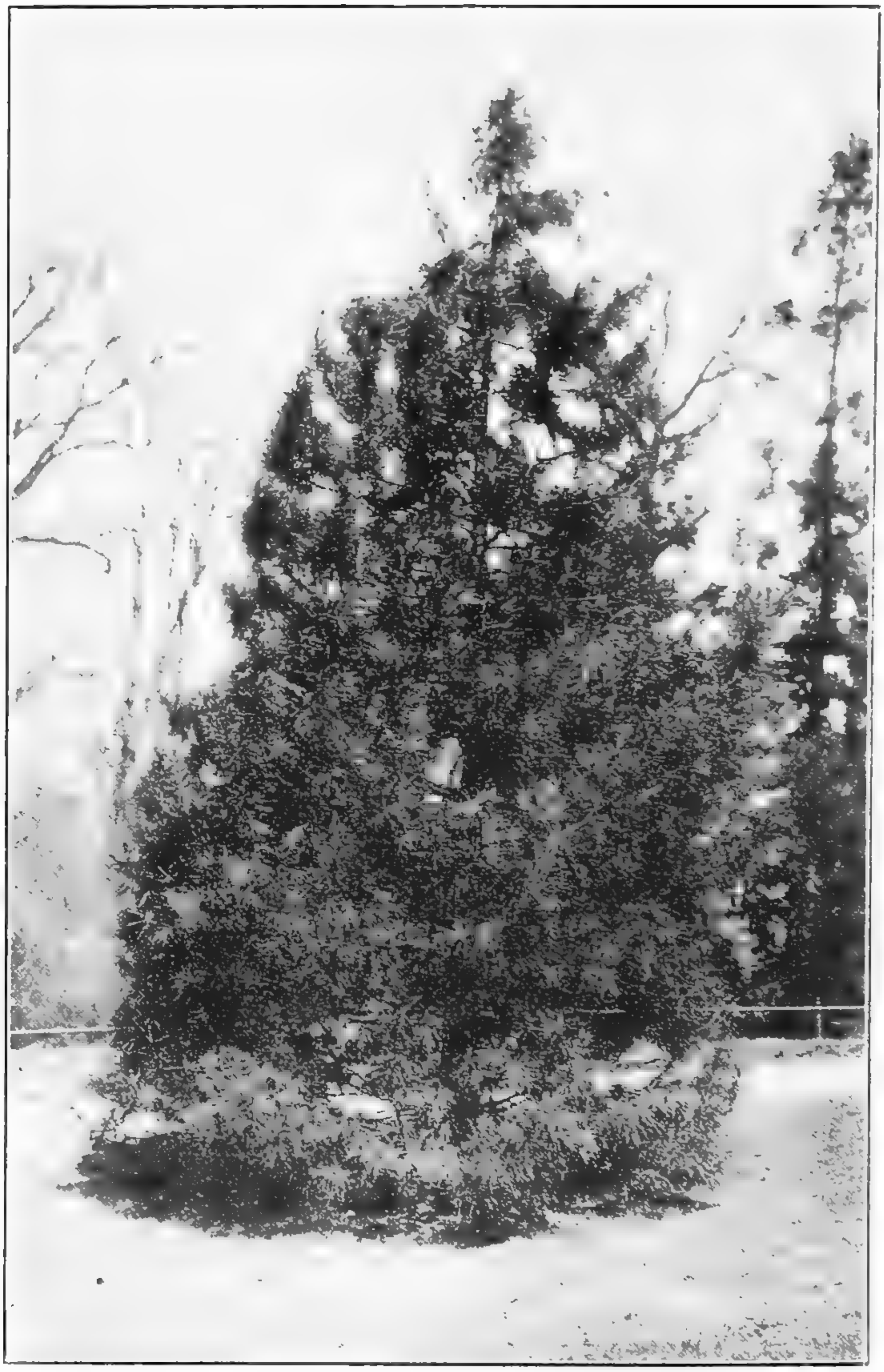


FIGURE 19. Umbrella Pine
Sciadopitys verticillata

PART 18—JAPANESE CEDARS

ROYAL TEMPLE TREES OF JAPAN

The collection of Japanese Cedars is located in a group across the path from the Umbrella Pines at the north end of the meadow that borders the Hemlock Grove on its western side (Map p. 137). These trees are

Cryptomeria japonica, the Japanese Cedar

This is one of the handsomest and most distinctive of evergreens. It forms a tall narrow tree of dark foliage and should be planted, preferably, as individual specimens to show its beauty rather than in masses, unless the latter be justified.

Cryptomeria is native to Japan and China, where it attains a height of from 100 to 180 feet, forming a majestic tree that rivals our Redwoods of California in grandeur. In the former country it has for ages been regarded with almost religious esteem and much planted about temples and shrines. There is a story in Japan that when the body of Ieyasu was laid to rest on the Nikko Hills his successor called upon all his followers to send each a stone or bronze lantern to decorate the grounds about the mortuary temples. All complied but one man, who was too poor. He offered to plant trees along the road to the tomb that subsequent pilgrims might be protected from the sweltering sun. His offer was accepted. The trees were planted at the beginning of the seventeenth century and ever since have been maintained or replaced as needed. Today, three hundred years later, that avenue of Cryptomerias is said to present one of the finest sights in the world.

Probably more impressive, according to a contemporary traveler, is another avenue of these trees over a mile long. They are said to have been planted by a priest, Ogo Shonin, about 650 years ago.

Throughout the Empire, Cryptomeria has been very extensively planted and with the exception of the Japanese Red-Pine, *P. densiflora* (p. 24), it is the most commonly grown conifer in Japan. Two decades ago Cryptomeria was said to constitute thirty per

cent of the Japanese forests. It consequently is the most used timber tree in Japan and one of the great lumber trees of the world. It has also been extensively used for reforesting denuded lands. It is known to the Japanese as *Sugi*. The wood is used for all sorts of construction purposes and the bark, carefully stripped from felled trees, is employed as roofing material.

The Cryptomeria thrives best in a climate which approaches that of our Redwood region. Under cultivation it requires deep, well-drained soil, with abundant moisture and protection from sharp wind.

The genus Cryptomeria is represented only by this single species found in Japan. There are, however, a few varieties of it. Approximately in the center of this group along the western side of the path and set back a bit we should find a tree whose leaves are more prickly than those of the others. It is

Cryptomeria japonica var. **pungens,** the Prickly Japanese-Cedar

At the northern end of the group are two trees with dark-green, short, stout, and stiff leaves. These are

Cryptomeria japonica var. **araucarioides,** the Araucarian Japanese-Cedar

All the trees in the smaller triangular area between the paths are plain Japanese Cedars.

It seems appropriate, at this point, to make mention of the public spirit of Mr. Lowell M. Palmer, through whose generosity the extensive collection of conifers in the Garden had its inception. Mr. Palmer had assembled a large collection of these trees at his home in Stamford, Connecticut, and in 1903, when the plantings in the Garden were begun, gave 450 trees to the Garden. In 1905, again, he donated 467 more trees. These generous contributions served as an important nucleus around which the present Pinetum has been developed.

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Bold-face type indicates kinds in the Garden; viz., **Abies homolepis** var. **Tomomi.**
Names in italics indicate kinds not in the Garden; viz., **Abies** *balsamea.*
Reference to other names indicates synonomy; viz., **Abies bifida,** see **A. Momi.**
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BULLETIN
OF
The New York Botanical Garden

Vol. 14 No. 52

REPORT OF THE ACTING DIRECTOR-IN-CHIEF

(*Accepted and ordered printed, January* 13, 1930)

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: An outstanding event of the year 1929 has been the retirement of the man who acted as your Secretary for more than thirty-four years and as the Director-in-Chief of The New York Botanical Garden for more than thirty-three years. Appropriate resolutions of your Board and of the Scientific Directors in regard to the services and the scientific achievements of Dr. N. L. Britton are in type for the January number of our *Journal*. Another outstanding event of the year 1929 has been the election of Dr. E. D. Merrill to succeed Dr. Britton as Director-in-Chief. Dr. Merrill's record as an executive and as a scientist has inspired the widest confidence in his success in his new undertaking.

During the year the improvements of the grounds and repairs to the buildings have continued, about as usual. Houses No. 2 and No. 3 of Conservatory Range 1 have been painted and reglazed; four concrete benches have been made in House No. 6, completing the installation of such benches throughout Conservatory Range 1. New concrete benches for the paths, to the number of 110, have also been constructed, making a total of 210 such benches now on the Garden grounds. New paths totaling a little more than 3,000 feet in length have been constructed. The growth in the population of the surrounding region has emphasized the seriousness of the question as to whether our institu-

tion is to continue to be a botanic garden or is to be converted into a public playground. The early completion of the path system and the bordering of these paths with low rail fences, some of which may be screened by low shrubs, vines, or herbaceous plantings, we believe to be the most practical way of preventing the evils that result from the trampling of many feet.

In the matter of improvements or changes financed and to be carried out under the direction of City officials, three projects have been approved and provided for by special City appropriations. These are the rebuilding of a section of the fence on the Fordham University boundary and the regrading of the adjacent foothpath; the removal of the stable, garage, and shops occupied by the Department of Parks; and the widening of Bronx Park East, involving the loss of a strip of land forty feet wide and the rebuilding of the eastern boundary fence. Plans and specifications for the first two of these projects are said to be nearing completion and it is expected that they will be carried out during 1930. Work on the widening of Bronx Park East actually began on January 3 of the present year (1930). Previous to the beginning of operations many of the smaller trees and shrubs were transplanted and the more desirable topsoil was removed. An item of about $15,000 in the City appropriation for the street-widening is for the purpose of replanting the new eastern border of the Garden. It is expected that the widened Bronx Park East will carry a part of the north and south through-traffic that has been using the existing roads in the Garden. To this relief, a City plan for the extension of Park Avenue to Gun Hill Road by the decking-over of the tracks of the Harlem Division of the New York Central Railroad, bordering the Garden on the west, may be expected ultimately to contribute.

An added and much-admired feature of the floral displays during the year was furnished by the planting of 88,500 bulbs of snowdrops, crocuses, squills, glory-of-the-snow, and grape hyacinths in a naturalistic way, under the

direction of Mrs. Wheeler H. Peckham, Honorary Curator of the Iris and Narcissus Collections. This, the earliest of the outdoor displays, was followed by the extensive collections of Narcissi and tulips. The collections of living Iris, maintained in coöperation with The American Iris Society, now include somewhat more than 1,300 forms, including both natural species and garden varieties. During the summer they were extensively rearranged and replanted under the supervision of Mrs. Peckham. The display of roses, including about 5,000 plants, was good, especially early in the season and late in the season. The collection of Gladioli, under the supervision of Dr. Forman T. McLean, was considerably enlarged and embraced 850 varieties and several natural species. The exhibit of water-lilies continued to attract attention. The displays of dahlias and chrysanthemums showed improvement over the preceding year, in spite of arid conditions during the three summer months. Fresh ground has been broken for next season's dahlia plantation. The Rock Garden, under the direction of Dr. E. B. Southwick, now includes about 1,800 species, and is an attractive feature of the Garden's exhibits. A new border of day-lilies about 400 feet long and ten feet wide has been planted in the North Meadows under the oversight of Dr. A. B. Stout, and ground has been prepared for a 300-foot extension in the spring. One hundred and one Japanese cherry-trees have been added to our ornamental collection through the generosity of Mr. Samuel Moffitt. The lilacs in the Garden, mostly planted several years ago, are now attaining proper age for good blooming; they number 560, representing 85 varieties. The filling-in of the former lake in the southeastern part of the grounds, now designated for a special plantation of rhododendrons and azaleas, has been nearly completed, 27,000 cubic yards of soil having been added during the year. Topsoil to the amount of 150 four-yard loads has been purchased and supplies of leaf mould and compost are being developed with a view to supplying proper soil for the healthy growth of these shrubs. Further expenditure of money and labor in this direction will, how-

ever, be necessary to secure the best results. Special collections of outdoor ornamentals are now very well organized for continuous displays during the spring, summer, and autumn months, though further developments of the collections of a few other popular decorative plants are still desirable. A further development of special floral displays under glass for the winter months deserves consideration in the near future. Public interest in the Garden would doubtless be enhanced by the existence of a special exhibit of flowers that would be worth traveling a considerable distance to see on any day of the year.

No Small Garden Competition was held in 1929, and the income of the H. H. Memorial Fund was devoted to the better upkeep of the existing small gardens in accordance with the wishes of the donor of the fund. The income has been devoted largely to the purchase of tulip bulbs for renewals.

Dr. A. B. Stout, Director of the Laboratories, has continued his work in crossing species and varieties of Iris and day-lilies; in breeding hardy seedless grapes and in studying conditions of fertility and sterility of fruit-trees, the latter two projects in coöperation with the New York State Agricultural Experiment Station at Geneva; and in the breeding and forestation of hybrid poplars in coöperation with the Oxford Paper Company.

Investigations in plant pathology, especially in the diseases affecting roses, irises, and dahlias, have been carried on under the direction of Dr. B. O. Dodge. Notable among these are experiments in growing irises in soils to which various disinfectants have been applied. His success in making crosses of certain species of filamentous fungi has attracted wide attention among geneticists. With the permission of the Board of Managers, Dr. Dodge is now serving as a consultant to a committee of the Medical Faculty of Columbia University in the investigation of some of the smaller fungi that cause human diseases.

Dr. Forman T. McLean, Supervisor of Public Education, has had charge of the Saturday afternoon lecture-courses

and the coöperation of the Garden with the nature-study work of the public schools. The increasing numbers of schools and garden clubs visiting the Botanical Garden and the assignment of Mr. Percy Wilson as special assistant to Director-emeritus Britton make necessary the appointment of a new docent to assist in the work of public instruction. Living plant material for the biology classes in the high schools has always been supplied to a limited extent. It has recently been officially suggested by the New York Biology Teachers' Association that the Garden greatly expand its service in this field.

The studies recently made by Dr. H. A. Gleason, Curator, of an extensive collection of plants made by an expedition from the American Museum of Natural History to Mt. Duida in southeastern Venezuela, have revealed a flora that is of great scientific interest, about half of the species being entirely new to science. The results await publication, as also do the results of other investigations of South American plants made by Dr. H. H. Rusby.

Dr. Arthur Hollick, Paleobotanist, in addition to other activities, has been studying collections of fossil plants from Colorado and Cuba and Tertiary cycads from Alaska.

The number of bound volumes in the Garden library at the end of the year was 39,282. Dr. J. H. Barnhart, Bibliographer, reports that, to bring the library to the desired state of perfection, much larger amounts of money should be available annually for many years to come and that present opportunities for satisfactory purchases are unusually good.

Through the generosity of an annual member, a Garden Bench, dedicated to the memory of Elizabeth Bigelow Estes, has been constructed from plans approved by the Municipal Art Commission. It is located between the Rock Garden and the Hemlock Grove and commands a pleasing view of the Iris Garden and the plantations of Narcissi and peonies.

The various publications of the Garden have been continued about as usual. A special number of the Bulletin—No. 51—consisting of an illustrated "Guide to the Pinetum"

by Mr. Edmund H. Fulling, was issued in August. This guide is of immediate use to students of trees and will prove of future interest as a historic record. The first volume of Dr. Fred J. Seaver's handsomely illustrated work on "The North American Cup-Fungi" has appeared. Dr. John K. Small's "Flora of the Southeastern United States" is in press, and the manuscript of Dr. P. A. Rydberg's "Flora of the Prairies and Plains of Central North America" is essentially ready for the printer.

Collections of plants in the field have been made by Mr. A. C. Smith, Assistant Curator, in Peru; by Dr. John K. Small, Head Curator, in Louisiana and in Florida, where he has continued to assist Mr. Thomas A. Edison in his rubber researches; by Dr. P. A. Rydberg, Curator, in Kansas and Minnesota; by Dr. Fred J. Seaver, Curator, in Colorado, Wyoming, and South Dakota. Dr. Elmer D. Merrill, now Director-in-Chief, is bringing to the Garden about 30,000 sheets of herbarium specimens, representing the flora of the Philippine Islands, Borneo, China, and other Oriental regions.

The more than thirty years of steadily increasing growth of the herbarium and library and the present demand for improved laboratory conditions are emphasizing the urgent need for an addition to the Museum Building. It is hoped that representations may soon be made to the municipal authorities, looking to the special appropriation of funds for the erection of one of the wings of the Museum Building as provided for in the architect's plan.

The Budget of the City of New York for the year 1930 contains an item of $256,345.00 for salaries and expenses of The New York Botanical Garden, a decrease of $70.00 as compared with the budget for 1929, as modified in April. There is, however, an item of $300,000.00 in the 1930 budget "For Adjustment of Personal Service and Expenses in the Various Public Libraries and other Institutions" and in this the Garden may expect a share, as has been the case with similar, though smaller, items in the City budget of the two previous years.

Many suggestions have been made for the expansion and improvement of the activities of The New York Botanical Garden. Most of the suggestions involve a greater power of expenditure than has as yet been available. However, the financial resources of the City of New York and of its public-spirited citizens are second to none. New York's Botanical Garden will be second to none.

MARSHALL A. HOWE,
Acting Director-in-Chief
(*August* 1, 1929, *to January* 1, 1930)

REPORT OF THE HEAD CURATOR OF THE MUSEUMS AND HERBARIUM

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I submit herewith my report as Head Curator of the Museums and Herbarium for the calendar year 1929:

The several units under my supervision were conserved and developed as in former years.

Through the several channels indicated in the following table, 16,734 specimens were added to the collections:

Through gifts and purchases	1,048
Through exchanges	4,916
Through exploration	10,770

Several hundred herbarium specimens were sent to other institutions as exchanges.

The specimens received came from various regions of both continents, but the vast bulk of material came from the New World. In a general way, it may be recorded that the bulk of specimens bearing directly on the active work of the Garden came from Alaska, United States, Mexico, Central America, northern South America, and the West Indies.

MUSEUMS

The exhibits of the six units comprising the public museums—the Fossil-plant Museum, the Economic Museum, and the Synoptic Collection, Microscope Exhibit, Plant-picture Collection, and Local-flora Exhibit of the Systematic Museum—were increased by the interpolation of specimens. The additions made to the economic collections were derived from exploration and from economic plants grown in the garden plantations.

The Fossil Plant Museum was under the supervision of Dr. Arthur Hollick, Paleobotanist. (For details see his report.)

The development of the Economic Museum was under the supervision of Dr. H. H. Rusby, Honorary Curator of the Economic Collections. (For details see his report.)

HERBARIA

Specimens incorporated in the permanent herbaria were derived from current accessions and from the accumulation of stored materials received in former years.

A total of 14,500 herbarium sheets, containing about 18,000 specimens of flowerless and flowering plants, was added to the permanent collections. Most of the material mounted came from continental North America, the West Indies, and northern South America.

A limited number of specimens received for the Columbia University herbarium, were mounted and incorporated in that collection.

Two collections of a special character were:

I. The moss herbarium, which was under the supervision of Mrs. N. L. Britton, Honorary Curator of Mosses. (For details see her report.)

II. The local flora herbarium, which was under the supervision of Dr. H. M. Denslow, Honorary Curator of the Local Flora herbarium. (For details see his report.)

INVESTIGATION AND COÖPERATION

Dr. P. A. Rydberg, Curator, has continued in charge of the herbarium of the flowering plants. Besides the routine work of sorting and selecting plants for mounting and distributing the mounted plants in cases, naming plants sent in for determination, answering inquiries, and supervising the distribution of exchange material, he has done the following research work: In the spring he continued his monographic work on the genus *Oxytropis* and on certain genera of Portulacaceae, and did incidental work on the flora of the prairies and the plains. In the summer he spent six weeks in field-work in Kansas and one week in Minnesota.

The field work in Kansas was very successful, he and Mr. Imler, representing Kansas State University, bringing home a collection of over 1,300 numbers and about 5,500 herbarium specimens. The autumn was partly devoted to determining and labeling the summer collections and partly to adjusting the specimens of several families in the herbarium, especially the Compositae, by inserting specimens in their proper places, correcting misidentifications, etc. His manuscript for a flora of the prairies and plains between the Mississippi River and the Rocky Mountains is almost ready for publication. The following publications have appeared from his hand during the year: "Genera of North American Fabaceae—VI." "Astragalus and Related Genera," in *The American Journal of Botany* (16: 197-206, *pl. 15-17*); Revision of the subtribe Aragalanae (except Oxytropis and Caragana) in the *North American Flora* (24: 251-462).

Dr. H. A. Gleason, Curator, as in the preceding years, devoted his time almost entirely to the study of the flora of northern South America, a project which the Garden has carried on for ten years in coöperation with the Gray Herbarium and the National Herbarium. This has involved not only the mere care of the collections and their incorporation into the herbarium, but also the careful and frequently laborious study of many of them as a prerequisite to their correct identification. Under this head, three activities have received his special attention: the genus *Monochaetum*, a monograph of which was recently published; the flora of Mount Duida in Venezuela, based on the collections of the Tyler-Duida Expedition; and a considerable collection from Colombia and Venezuela, sent us from the Botanical Garden in Leningrad. In all of his work he was ably assisted from January till March 22, and again during December, by Assistant Curator Albert C. Smith, who also gave intensive attention to *Weinmannia*, *Viburnum*, and certain ferns. Mr. Smith was absent on leave from March 22 until December 1, during which time he made extensive collections in Peru.

Dr. Fred J. Seaver, Curator, continued to look after the mycological collections. Mounting of specimens was continued as rapidly as time permitted. With the permission of the Scientific Directors, he spent two months during the summer in a mycological foray through the mountains of Colorado, Wyoming, and South Dakota in coöperation with Mr. Paul F. Shope of the University of Colorado. A collection of nearly 700 numbers of fungi was obtained, many of them in duplicate. These will be subdivided into a number of specimens for exchange purposes. He devoted especial attention to the cup-fungi in continuation of his monograph of North American Cup-fungi (Inoperculates), a companion volume to the one just issued on North American Cup-fungi (Operculates). He also attended the summer meeting of the western section of the Botanical Society of America at Laramie, Wyoming, as representative of The New York Botanical Garden. A preliminary report of this summer expedition was published in *Mycologia* for January-February, 1930, which was issued on the 31st of December. He gave the usual lectures in connection with the Garden course.

Mr. Percy Wilson, Associate Curator, continued his studies of West Indian and South American plants. During the year he has named several thousand specimens from Cuba and Colombia for other institutions. He has also determined many host-plants from Porto Rico for specialists in fungi. Mr. Wilson has assisted in docentry during the summer, having taken charge of many classes from the high schools of Manhattan and the Bronx, especially classes from the New York Training School for Teachers. Since he has been made Dr. Britton's special assistant, he has been associated with him in his studies of tropical-American flowering plants.

Mrs. Palmyre de C. Mitchell, Associate Curator, continued sorting of unmounted and the distribution of mounted specimens in the herbarium. The herbarium sheets of Mimosaceae which were studied by Dr. Britton for the North American Flora, and those of Fabaceae

studied by Dr. Rydberg, were so indicated by a special stamp used for that purpose. Loans of herbarium specimens to other institutions were selected, listed, and packed for shipment, and on their return the corrected determinations were noted in our records and the specimens redistributed in the herbarium cases. The mechanical care of the general herbarium was continued. Species covers were written and the herbarium sheets sorted geographically as well as alphabetically in the many plant-families.

The routine work of the Local Herbarium was carried on as usual. It consisted of some distributing, sorting, and laying out specimens for mounting, and also recording and writing labels of the Bicknell Herbarium.

The undersigned, in addition to general curatorial routine, devoted his attention to the development of the collections, especially those comprising the plants of the southeastern United States, in the way of living and dried specimens. Special studies were made in the plantations of native irises, both those of eastern and western North America, those of *Hymenocallis,* and those of the miscellaneous collections from the Gulf States, all brought together by personal collection and by correspondence in this and in former years by the undersigned. Specimens from all of these plantations were used as subjects by Miss Eaton, Artist, for paintings for publication in *Addisonia.* Intensive studies were made in the flora and floristics of the Gulf States and in a taxonomic and geographic interpretation of their vegetation. Two seasons of exploration were devoted to parts of Florida and Louisiana, with especial attention to the native iris. This field-work was done with the coöperation of Mrs. Arthur Curtiss James, Mr. Clarence Lewis, and Mr. Henry Lockhart. In connection with our iris studies, in addition to the plantations at the Garden, other plantations of the Gulf States iris have been established in New Jersey, Maryland, and Florida. Living material has also been sent to England and to California for horticultural purposes. A series of crosses among the native irises in the plantations was made with the coöpera-

tion of Mrs. Wheeler H. Peckham, Honorary Curator of the Iris and Narcissus collections and the American Iris Society. Mr. Edward J. Alexander, Assistant Curator, coöperated in all the activities mentioned above at the Garden, and he also edited *Addisonia*. Some time, both in the north and in Florida, was devoted to Mr. Thomas A. Edison's investigations of rubber in our native plants. Some of the information resulting from former field-work and studies was embodied in fifteen articles published during the year.

Respectfully submitted,

JOHN K. SMALL,

Head Curator of Museums and Herbarium

REPORT OF THE HEAD GARDENER

DR. MARSHALL A. HOWE, ACTING DIRECTOR.

Sir: I have the honor to submit my annual report for the year 1929.

HORTICULTURAL OPERATIONS

The outside force of 13 gardeners under the direction of Mr. John Finley, Foreman Gardener, in addition to maintenance work in grounds, gardens, and Hemlock Grove, carried out several extensive plantings. Trees and shrubs were added to the grounds during both spring and fall planting seasons. 31 trees were added to the section of roads and paths, and 146 shrubs to the decorative sections. Under the direction of Mr. John Hartling, Head Gardener's Assistant, seventeen and a half beds of Iris have been replanted and every plant sterilized, and the beds refilled with topsoil. The extensive gladiolus collection was planted with 7,000 corms, in about 850 varieties. There were 101 Japanese cherry-trees planted, the gift of Mr. Samuel Moffitt. 46,050 tulips in 121 varieties have been planted in the Conservatory Court and about 1,000 in the Prize Gardens. The new Hemerocallis Border, which is 700 feet long and 10 feet wide, has been planted with 424 plants in 39 varieties. The conservatory beds were replanted with annuals as usual. Dr. Southwick has replanted and added new plants to the Rock Garden, which he has raised from seed and cuttings. The Rose Garden was very generously replanted again by Bobbink and Atkins, of Rutherford, N. J. 400 square feet of nursery land was opened up for Dr. Dodge, and 250 square feet of nursery for Dr. McLean. The Rhododendrons and other groups of ericaceous plants were mulched with peat moss, and the Museum terraces were weeded and reseeded. 150 loads of topsoil were placed in the Iris Garden beds. Hemlock, dogwood, and yew trees, and laurel, Azalea, and Pachysandra were planted around the new Elizabeth Bigelow Estes Memorial, overlooking the Iris Garden.

GREENHOUSE OPERATIONS

The greenhouse force of 19 gardeners under direction of Mr. H. W. Becker, Foreman Gardener, maintained the conservatories as usual. The plants in Houses 2 and 3 were taken out and placed in 14 and 15, during the repairing of these houses and after the repairs had been done the plants were replaced; also, the plants on the side benches of House 6 were taken out so as to make room for new cement benches. All the ashes on the benches of Houses 2, 3, 5, 7, and 8 were taken out and replaced with sand grit. The rearranging of Houses 1, 2, 3, 4, 5, 6, 12, 13, 14, and 15, took place during the year. Eight large palms ranging from 20 to 45 feet in height were transplanted from tubs to the ground with new soil and a rockery built around them. General gardening, transplanting, and pruning in all the houses was carried on during the year. Flowering plants for the Central Display House, Range No. 2, were raised, among them 300 Chrysanthemums, 90 Pelargoniums, 140 Begonias, 150 Fuchsias, 70 Hydrangeas, 60 Gloxinias, 25 Impatiens.

Cacti and other plants of the arid regions of southern California were generously donated by Mrs. A. Sherman Hoyt of Pasadena, California, to make replacements in her noteworthy exhibit of the characteristic flora of the Mojave Desert.

SUMMARY FROM ANNUAL REPORT

Accessions:

Plants received	7,433	
Bulbs "	2,050	
Seeds (packets) received	1,692,	including 50 collected by members of this department

Collections:

Conservatories	25,985	plants			
Arboretum	1,154	"	367	species and	varieties
Fruticetum	2,407	"	684	" "	"
Pinetum	2,971	"	234	" "	"
Herbaceous			4,000	" "	"

Outdoor Displays:

	Plants	*Varieties*
Tulips	46,050	121
Narcissus	200,000	150
Iris		1,300
Peony	543	280
Roses	5,000	280
Dahlias	1,050	400 (about)
Chrysanthemums	579	162
Cannas	1,071	69
Lilac	560	85
Mallows	560	
Variegated Plants	510	68
Dwarf Plantation	74	29
Fall-flowering shrubs	85	11
Gladiolus	7,000	850 (about)

Planting Additions:

	Plants	*Varieties*
Iris, English, Dutch, and Spanish	595	33
Phlox	350	56
Aster	178	35
Delphinium	630	28
Hemerocallis Border	424	39
Roads and Paths	31	
Decorative Planting	146	
Estes Memorial	600	7
Show Labels	6,302	

We have been engaged almost continuously throughout the year in supplying exchange collections to other institutions and schools, and furnishing materials for class work.

I have given four lectures in the regular courses at the Garden. 6,302 show labels have been made and put in place, and data labels rewritten for all houses and collections. 200 specimens have been added for the cultivated herbarium, and 900 have been mounted and distributed.

Respectfully submitted,

KENNETH R. BOYNTON,
Head Gardener

REPORT OF THE HONORARY CURATOR, IRIS AND NARCISSUS COLLECTIONS, 1929

NARCISSUS COLLECTION

Few changes have been made in the Narcissus collection. Owing to very late frosts some of the plants did not bloom well, namely those that were under the shadow of the crag of rock at the south end. In the middle of the day this place that had been shaded early, and which had no protection from trees, was exposed to a sudden full sun. These bulbs probably would not have shown a large percentage of bloom in any case because of the very rainy summer of 1928; but the frost most certainly ruined whatever buds there were, as over an inch at the apex of the leaves was quite brown. The variety which suffered most was Victoria. It was decided not to disturb the Narcissus bulbs this summer because of the rainy weather the year before; if the coming spring should be normal, some thinning can be done and further plantations made. If there should be a quantity of good bulbs, it is proposed to continue the naturalistic plantings in another location. The bulbs received from Mr. Wister in 1928 bloomed but were not labeled, as they are of valuable kinds and it was hoped to get an increase before a chance of theft was given. In spite of the unfortunate weather, no signs of loss from basal rot or Narcissus flies could be found.

IRIS

The Iris work has been carried on in many lines. Dr. Small continued his collections in Florida and Louisiana, the plants being potted and put in the frames and planted in the nursery. Those from previous years gave magnificent bloom and, with the exception of one or two varieties, made such a heavy mat of foliage that it was decided to leave them with no covering for this winter. Those which had sparse foliage were covered with salt-hay. All plants had some granulated peat-moss spread about one inch thick

about and between them. This retains what moisture there is in summer and is a certain amount of protection during autumnal frosts.

A number of the plants from crosses made under Dr. Stout's direction bloomed in the frames and some interesting results were recorded. The American Iris Society had some paintings made of these which they expect to publish. Other seedlings, which had been planted out, gave a profusion of bloom and were checked over. Varieties discarded were sent to Mr. Clarence Lewis, who will grow them under number, so they can be referred to by Dr. Stout if at any time he finds it necessary. Many of these plants will make a fine showing, as they have good flowers, though not distinctive enough to be kept.

Bearded varieties in the trials of 1928 at the Nursery were dug and distributed, added to the Alphabetical Collection, or destroyed as requested.

As the beds in the Color Planting experimented upon by Dr. Dodge in 1928 showed such good results, it was decided to replant all the others in that vicinity and Dr. Dodge took charge of this operation. The plants were removed and sterilized, the beds were dug, the old soil thoroughly sterilized with formaldehyde and new soil added. The plants made remarkable growth in spite of the long and severe drought. They have been given a slight covering, as it was deemed safer after such drastic treatment.

The Alphabetical Garden did very poorly and is evidently suffering from the same diseases and pests as the rest of the Bearded Iris Collection and will have to be gone over this spring early in the same manner.

The Beardless Collection will need attention early this spring also, as it is proposed to fill in the gaps in the beds with blocks of the handsome forms of *Iris sibirica* raised from crosses made by Mr. Moore and which have now developed into very large clumps in the nursery. These should grow splendidly in the new location and make a better effect, illustrating how they are suited to garden use. Some of the southern native Irises that have proved the

most easy to manage will be tried here also. Japanese varieties did excellently this year and with the proper cultivation should make a fine display.

Plants Added

Collected by Dr. Small:	(Florida)	360	
	(Louisiana)	902	 1,284
	(Virginia)	22	
Derived from seed:			32
Sent for judging:			45
Sent for study:			88
Donated to Collections:			20
Added to Collections from Trials:			14
			1,483

Donors

James Allen, Clair A. Brown, W. M. Buswell, Mrs. E. F. Canthen, F. Denis, A. O. Garrett, C. E. F. Gersdorff, G. H. Hudson, Kodiak Co., E. G. Lapham, Longfield Iris Farm, C. E. Moore, Frederick H. Moore, F. C. Morgan, J. C. Nichols, Mrs. E. A. S. Peckham, Amos Perry, F. J. Seaver, A. & R. D. Svihla, O. J. Conery, J. K. Small, G. Thomas, E. T. Wherry.

Respectfully submitted,

ETHEL ANSON S. PECKHAM,

Honorary Curator, Iris and Narcissus Collections

REPORT OF THE DIRECTOR OF THE LABORATORIES FOR THE YEAR 1929

DR. M. A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I submit herewith my annual report for the year 1929.

GENERAL MATTERS

Miss Clyde Chandler has continued as Technical Assistant during the year and has assisted in the personal research of the writer and in the routine duties in the care of the laboratories. The meteorological records have been kept and reports for each month and for the entire year have been published in the *Journal of The New York Botanical Garden.* Programs for the monthly conferences of the scientific staff have been arranged. During the year plans have been perfected for installing additional electric wiring in the laboratories that will add further efficiency to the equipment. The rather limited space devoted to growing plants for experimental work continues to restrict somewhat the progress of such work.

COOPERATION IN THE LILY DISEASE INVESTIGATION

The scholarship established for the investigation of lily diseases as outlined in my report for 1927, has been extended and will continue throughout 1930 with Mr. Carl F. Guterman still the recipient of the scholarship. It has become very apparent that virus diseases are very destructive of garden lilies and that thorough rouguing is necessary in order to reduce or eliminate the disease from any planting. Mr. John T. Scheepers has donated bulbs of various hardy lilies for display plantings in our Garden, and a special effort is being made to maintain these free from disease by destroying diseased plants as soon as they are detected.

COÖPERATION WITH THE AMERICAN IRIS SOCIETY

For the fifth time, a scholarship was granted by The American Iris Society for work with irises. This year the

scholarship was awarded to Miss Dolores J. Fay. A special study of the longevity of iris pollen showed that pollen that is naturally viable may be kept viable for at least three months. Thus pollen of irises may be stored for later use in breeding. Considerable seed was also obtained from cross-pollinations involving the new southern irises obtained by Dr. John K. Small. Miss Clyde Chandler also made studies, with the coöperation of Mrs. Ethel Anson S. Peckham, of the various seedlings of previous breeding that bloomed for the first time this year. Reports of this work have been submitted to The American Iris Society.

INVESTIGATIONS WITH POPLARS

The coöperation with the Oxford Paper Company in the breeding of poplars and in forestation with poplars continues, and various problems in the taxonomy and the pathology of poplars are being studied in our laboratories by Mr. E. J. Schreiner as a registered student of the Garden.

PERSONAL RESEARCH

Problems involved in the sterility and fertility of plants and in plant-breeding continue to be my chief research.

Studies with Hemerocallis. Research with this genus has continued along the lines presented in my report for 1928. Most welcome assistance to the work of breeding the daylilies has now come through the offer of Mr. Clarence Lewis to grow seedlings on his estate at Skylands, in northern New Jersey. About 1,000 seedlings were taken to Skylands in the spring of 1929, and it is planned to take there several thousand more in the spring of 1930. This greatly promotes further selective breeding for the development of new red-flowered types and for breeding with the late-blooming species *H. multiflora.* The critical study of the various species and varieties continues. The collection of species and clonal varieties and the various hybrid seedlings already of blooming age are also being utilized in cytological studies and in experimental studies with special refer-

ence to sterility and fertility. During the year several papers have been published on various of the studies with the genus *Hemerocallis*, including a number of *Addisonia* devoted entirely to species of this genus. During the autumn several hundred seedlings were placed in a new display planting in the North Meadow and it is the plan to add more seedlings to this planting in the spring of 1930. About 100 seedlings of daylilies have now been selected as choice plants. Four seedlings have now been given horticultural names and are being propagated for distribution by the Farr Nursery Company.

Research in coöperation with the New York State Agricultural Experiment Station. For several years I have spent about ten days during the flowering period of fruit trees at Geneva, New York, in studies of the botanical aspects of the pollination requirements. The results of these studies are now included in a bulletin, of which I am a co-author, that is soon to be published by the New York State Agricultural Experiment Station.

The project of breeding for the development of hardy seedless grapes is now progressing rapidly. One seedling with seedless fruit that thus far appears to be hardy was obtained from a cross made in 1921.*
This vine has been named and is being propagated for distribution in the near future. It and a sister seedling are being used in further breeding. In the breeding work with grapes in 1927 and 1928, over 3,000 seeds were obtained and in 1929 more than 2,000 seeds were secured. In nearly all of these some one of the *vinifera* seedless varieties, Sultanina rosea, Sultanina, Sultana, Panarite, Black Corinth, and Black Monukka, was involved in the parentage. Many of the seedlings die from winter injury, but each year additional hardy vines are obtained. One cross between a Station seedling of merit and the Sultanina rosea has given

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* A description of this plant with illustrations and a record of its pedigree has been published as follows:

A new seedless grape. Jour. N. Y. Bot. Garden **28**:20-23. 1927.

A new hardy seedless grape. Jour. Heredity **19**:316-323. 1928

more than 50 seedlings that have thus far been fully hardy at Geneva, and many of these will bear fruit for the first time in 1930. The results already obtained warrant the belief that it is possible to develop by the methods we are employing hardy seedless grapes of quality suited to culture in New York.

Cytological Studies. In addition to the cytological studies of the genus *Hemerocallis* already mentioned, considerable study has been made of the pollen-tube behavior in cases of self- and cross-incompatibility in *Hemerocallis, Brassica,* and *Lilium.* A report of the results of this work will probably be published in the near future.

Other Investigations. Studies of various types of sterility, of variegation, and of doubleness are being made in several plants that can readily be grown in the experimental greenhouse. The studies with *Abutilon* are being continued by Mr. John Keur as a student's problem. The studies of doubleness in *Pelargonium* are being made by Mrs. Jean Kerr as a voluntary research worker. Many seedlings are now being grown of crosses between various types of Lily-of-the-Valley, and especially with the use of the pink-flowered form, but it will evidently be several years before these seedlings will bear flowers.

REGISTERED STUDENTS AND SCHOLARS

During the year the following persons have been enrolled at the Garden either as recipients of scholarships or as students registered for degrees:

ANDERSON (MRS.), GLADYS POMEROY, Morphology of Algae.
BETTS, EDWIN MORRIS, Mycology.
BONISTEEL, WILLIAM JOHN, Research on *Aconitum.*
BOWERS, CLEMENT GRAY, Breeding of Rhododendrons and Azaleas.
FAY, DOLORES JOAN, Breeding of Irises.
FRIED, DOROTHY, Mycology.
FULLING, EDMUND H., Nutrition of Woody Ornamentals.
GALE, ANNA ELIZABETH, Plant Breeding.

JOHANSEN, DONALD ALEXANDER, Cytology of the Onagraceae.
KEELEY, NORMA, Plant Breeding.
KEUR, JOHN YAK, Studies of *Abutilon*.
MOLDENKE, HAROLD NORMAN, Taxonomy.
RILE, JOSEPHINE CONRAD, Taxonomy. Plant Distribution.
ROBERTS, CHARLES M., Taxonomy of Mosses.
SCHREINER, ERNEST J., Pathology and Taxonomy of *Populus*.
SWIFT, MARJORIE ELIZABETH, Cytology and Mycology.

In June Mr. Clement Gray Bowers completed the work required for the degree of Doctor of Philosophy which was granted by Columbia University.

Respectfully submitted,

A. B. STOUT,
Director of the Laboratories

REPORT OF THE PLANT PATHOLOGIST

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I have the honor to submit herewith my annual report for the year 1929.

In coöperation with Dr. R. P. White of the New Jersey Agricultural Station, work was begun on a study of dahlia diseases, especially those types which appeared to be in the nature of virus diseases. Certain plants suspected of carrying viruses were grown in screened cages, and all plants in the dahlia border were inspected several times during the summer. The results of this preliminary work indicate the possibility of detecting very early a large percentage of those plants which will fail to bloom satisfactorily and which are liable to become a menace by way of spreading infection. Species of *Fusarium* and other fungi and bacteria have been isolated from diseased plants. Their pathogenicity has not been proved.

Conditions determining the spread of black spot and mildew of roses were such, during the past summer, that these diseases were readily controlled. Infection experiments on susceptibility and cytological work on the host-parasite relation are in progress. Much of the trouble heretofore attributed to winter-killing is clearly due to the fungus causing brown canker, a disease not controlled by the common fungicides which can be used satisfactorily in a rose garden. Space has been provided where further experiments in this connection can be carried on out of doors.

Aside from the common bag worm, *Thyridopteryx ephemeraeformis*, and the pine-bark louse, *Adelges pinicorticis*, which appeared suddenly in considerable numbers, destructive insects were not particularly numerous during the summer. The Japanese cherries have been freed from the West Indian peach-scale, *Aulacaspis pentagona*, so that this insect need no longer be considered a menace. Several species of insects not heretofore observed in this locality were found infesting individual plants about the grounds.

Among these which may require attention were *Lachnus Strobi* on white pine, *Aspidiotus ancylus* on horse chestnut, *A. Abietis* on species of hemlock, and *Anuraphis Tulipae* on iris and gladiolus.

An investigation into the cause of the death of numbers of phlox plants in the borders resulted in the discovery, by Dr. G. Steiner of the Bureau of Plant Industry, that the malformations of leaves and stems are caused by the nematode *Tylenchus Dipsaci*, and that they are the symptoms indicating the presence of the worms which ultimately kill the plants. Eighteen species of ferns in the greenhouse were found to be infested with the fern nematode, *Aphelenchus olesistus*. Some of the infested plants were given the hot water treatment with more or less success. Dr. Steiner is working out a control for the phlox nematode.

Larvae of the Asiatic beetle, *Aserica castanea*, and of one of the June beetles were found working in the soil north of the Museum, and a few adult beetles of these species were found among the dahlias in the border. We have been advised that we will suffer no serious loss from these insects for at least four or five years.

The services of Miss Marjorie E. Swift as assistant pathologist were secured early in the year. She is carrying on culture work with pathogenic fungi, and is making rapid progress in the preparation of a host index of diseases and insect pests of ornamental plants.

I have undertaken to act as an advisor and consultant at the Medical College of Columbia University on questions relating to the fungi causing human diseases. While acting in this capacity, it has not been necessary to carry on any work with these fungi personally. It may be well, however, to consider the desirability of looking to the time when our facilities might be used to contribute directly in the acquisition of knowledge regarding the nature and life histories of these pathogenes, and thereby be of still further service to the community.

Experiments on hybridizing races and species of fungi have been carried on during the year. An albino race of

the common bakery mold, *Neurospora sitophila*, originally arising as a mutant, has been crossed with typical races of the parent species, and also with typical strains of *Neurospora crassa* and *N. tetrasperma*, so that we now have as the result of segregations albino races of both sexes of the three species which can be propagated sexually as distinct forms. The only fertile inter-specific hybrids so far reported in the Ascomycetes are those which have been obtained by crossing species of the genus *Neurospora*. Some of these results have been published in Mycologia recently. A further paper on the subject is in preparation.

I take this opportunity to express appreciation of the work of Drs. E. P. Felt, C. A. Weigel, K. F. Chamberlain, H. C. Hallock, and others who have identified many species of insects sent them and supplied information regarding methods for their control.

Respectfully submitted,

B. O. DODGE,
Plant Pathologist

REPORT OF THE SUPERVISOR OF PUBLIC EDUCATION

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I have the honor to make the following report for the year 1929. This is my first full year of service in this work and to give a satisfactory idea of the scope and needs I have taken the liberty to deal with it in some detail at this time.

LECTURES

The illustrated public lectures on botanical and horticultural subjects were given in the Museum Building on Saturday afternoons from March to November inclusive. Forty lectures were thus given in this series, to a total attendance of 3,793 people. In connection with these popular educational lectures a few rather urgent needs developed during the year. First, our projection screen has become so old and wrinkled as to be unsatisfactory and it was replaced by a new one of somewhat smaller size which will accordingly give us a sharper image.

Winter lectures at the Central Display Greenhouse were given through the months of January, February, and December. The policy was continued of making these practical demonstrations of primarily horticultural interest and the response was very gratifying. Eleven of these demonstrations were given and despite inclement weather and the difficulty a number of people encountered in getting to Range 2, the total attendance was 719 people, an average of sixty-five for each lecture, and a number of times the total attendance exceeded the seating capacity of the platform.

DEMONSTRATIONS FOR STUDENTS

The request for guidance by classes and groups of students, horticultural societies, and other organizations continued to be quite heavy during the spring and autumn months particularly. Mr. Wilson, Mr. Williams, Mr. Boyn-

ton, and Mr. Fulling assisted in caring for these visits as in the past. In response to an invitation sent out in coöperation with Mr. Van Evrie Kilpatrick of the Department of Education, parties of students from the public schools visited the Garden with their teachers during May and early June, the total number of pupils being slightly in excess of 2,000. To care for these, it was necessary frequently to call on Mr. Wilson to take classes while I was engaged with others and this work absorbed a good deal of his time. Since he was definitely assigned to assist Dr. Britton after the first of July, I did not feel that I was justified in calling upon him quite as heavily in the fall as I had in the spring and accordingly did not send out any special invitation to the teachers for the fall term. Since the number of pupils coming to the Garden in the spring was twice as great as when this work was inaugurated the previous autumn, it is exceedingly probable that had it been continued this autumn the number would have been in the neighborhood of 4,000. To care for these and other activities which have developed in connection with the public education work, the services of a well-trained botanist and teacher would be very desirable. We could then expand the work of this character without making it unduly burdensome on the present members of the scientific staff. In addition to the small classes which constitute the greater number of our visitors to the Garden, large groups of students were brought both in the autumn and the spring from the Theodore Roosevelt High School and the Evander Childs High School to study the collections in the greenhouses, in the Museum, and outdoors on the grounds.

DOCENTRY

During February and March a series of special excursions for the study of the woodlands of the Botanical Garden were announced and carried through. These brought out parties from the Torrey Botanical Club and other hiking clubs of between fifteen and thirty people at each of the seven trips. Members of the Poughkeepsie Garden

Club, the Garden Section of the Contemporary Club of White Plains and other organizations visited the Garden during the year.

PUBLICITY

The weekly notices to the newspapers in New York and in the suburbs have been continued throughout the year and practically all of this material has been published, a number of the local papers having made it a practice to publish all of the material sent them regularly. Forty-one items consisting of one hundred and sixty-eight typewritten pages of manuscript have been sent out during the year 1929. The original purpose of these sendings was to reach the small suburban communities through their local papers, but since this service was inaugurated a number of the metropolitan dailies have requested copies of our sendings, and schools and garden clubs have likewise asked for them, so that our present list to which we mail this material totals one hundred and eighty. A number of articles have likewise been published both by myself and other members of the staff in horticultural magazines and newspapers.

OUTSIDE LECTURES AND ACTIVITIES

Twenty-seven lectures in which slides belonging to The New York Botanical Garden were used were given by members of the staff before garden clubs and other outside organizations. Of these eleven were given by myself personally. One talk was also given over the radio, describing the work of The New York Botanical Garden and a repetition of this is asked for the latter part of February this year. The Garden was also called upon to furnish judges in connection with a number of horticultural and flower shows as well as the garden contests conducted by the New York World and by the garden clubs of Crestwood. Through the contacts made in this way a large number of people interested in gardening and plant life became acquainted with members of The New York Botanical Garden staff and with the activities carried on here. The demand, both in the

city and in the suburbs, for information and for popular courses of instruction in botany and horticulture steadily increases. The teachers of the Bronx sent in a special request for courses of lectures at the Botanical Garden which would benefit them in their school nature-study work and for which they might receive academic credit to count toward their advanced standing in the educational system in New York. Such service to the teachers seems an entirely appropriate one for the Garden and with the services of a docent employed on full time at the Garden, I feel that he and I could successfully conduct such work advantageously.

PHOTOGRAPHY AND LANTERN SLIDES

592 colored lantern-slides and 165 uncolored lantern-slides have been made to illustrate new lectures and to supplement old ones during the year. The very artistic as well as accurate color work of Miss Fleda Griffith has been the occasion of frequent favorable comments by people attending the lectures throughout the year. There have also been 557 photographs made during the year, including both pictures of living material and outdoor scenery and photographs of herbarium sheets, book illustrations, and other material primarily of scientific interest. The amount of such work continues to increase and much of the scientific part of it in particular can be done more efficiently by adding a photostat to our present photographic equipment.

PERSONAL INVESTIGATIONS

Studies of inheritance in the genus *Gladiolus*, cross-breeding experiments and tests of the viability of gladiolus pollen in coöperation with Dr. A. B. Stout were carried on through the year. For display purposes in the Garden more than 800 varieties of gladiolus were grown in the Horticultural Grounds this summer, and in coöperation with the newly organized Metropolitan Gladiolus Society a very satisfactory gladiolus show was held at the Museum Building on September 7 and 8, when the outdoor display

at the Garden was also at its height. The scientific collection of gladiolus species at the Garden now includes between thirty-five and forty of the wild forms, assembled from all parts of the range of the genus from Central Europe and Asia Minor to South Africa and Madagascar. A brief paper on the gladiolus species and their importance in the evolution and modern garden types was reported in *Torreya* for March of this year.

Respectfully submitted,

FORMAN T. MCLEAN,
Supervisor of Public Education

REPORT OF THE BIBLIOGRAPHER

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: In addition to routine work connected with the Library, more bibliographic research than usual has been accomplished during the past year. This has included considerable study of the botanical dissertations submitted by university candidates for advanced degrees, a sadly neglected corner of botanical bibliography. Much attention has also been given, both in bibliographic research and in securing additions to our Library, to the literature of fossil plants; this field is closely linked with geology and general paleontology, and is little known to most botanists.

The growth of the Library has been gratifying, but much larger amounts of money should be available annually for many years to come, if our collection of books is to attain the degree of perfection desired by those having its interests at heart. Present opportunities for satisfactory purchases are unusually good, and the favorable conditions are not likely to improve.

Parts 5, 6, and 7 of volume 24 of *North American Flora* have appeared, in February, May, and July respectively. The expected publication of parts of volume 18, referred to in my last report, has been prevented by circumstances beyond editorial control; they may be issued in 1930.

Respectfully submitted,

JOHN HENDLEY BARNHART,
Bibliographer

REPORT OF THE LIBRARIAN

DR. M. A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: The year 1929, though unmarked by any unusually large purchases of books, has nevertheless been one of steady growth for the library.

The question of additional shelving space is one which will confront us in the not far distant future. There are in the laboratory two stacks which are partially filled with duplicate books from the Geneva and Barnhart collections, while the duplicate closet is filled to overflowing with similar material. Since the time of the library staff is completely occupied by the usual routine work, it would seem advisable to secure the services of an expert indexer for a time sufficient to list these duplicates so that they might be offered for sale. The space which they occupy would thus be released for library use.

There have been added to the collection of bound volumes during the past year the following: by purchase, 215; by gift, 29; by exchange, 12; and by binding 641, including 26 which are the property of Columbia University, making a total of 897.

There were in the library at the close of 1928, 38,385 bound volumes, which, added to the number gained during 1929, 897, makes a total of 39,282.

There have been accessioned during the year, 708 pamphlets remaining from the Geneva collection and approximately 1,000 unbound books and pamphlets acquired by gift or purchase.

An especial effort was made during the past year to prepare for binding some of the hundreds of collections of pamphlets classified by author or subject. As a result, 36 of these have been provided with a table of contents, the pamphlets and cards numbered and the volumes bound. Much work of a similar nature remains to be done.

Since many of the older works in the library are in need of rebinding, it is hoped that funds for this purpose may be available during 1930.

The total number of catalogue cards typewritten and filed during the year was 3,230; those issued by the Torrey Botanical Club and filed, 4,158; those issued by the Gray Herbarium and filed, 3,300.

A new metal case for the official file of the Torrey cards has been secured, the old one thus released being taken to supplement the cases filled with the Gray Herbarium (new species) cards.

It is hoped that lights for the tables and catalogue cases may soon be provided.

The following additions and corrections should be made to the serial list as published in the Report of the Librarian for 1927 (Bulletin N. Y. Bot. Gard. 13:285-303) and supplemented in the report for 1928 (13:381).

Add the following:

*Annales de Cryptogamie Exotique, Paris, France.
Annales du Service Botanique, El-Ariana, Tunis, Africa.
Azerbaijan, Commissariat of Agriculture, Baku, Azerbaijan, *Transactions.*
Belgrade Université; Institut et Jardin Botanique, Belgrade, Jugoslavia. *Bulletin.*
Buenos Aires. Instituto Bacteriológico del Departamento Nacional de Higiene, Buenos Aires, Argentina. *Revista.*
*Der Züchter, Berlin, Germany.
*Desert Magazine, Pasadena, California.
*Journal of the Cactus and Succulent Society of America, Los Angeles, California.
*Journal of Economic Entomology, Geneva, New York.
Lingnan Science Journal, Canton, China.
*Monatsschrift der Deutschen Kakteen Gesellschaft, Berlin, Germany.
Perm. Institut des Recherches Biologiques, Perm, U. S. S. R. *Bulletin, Travaux.*
‡Société d' Histoire Naturelle de Toulouse, Toulouse, France, *Bulletin.*
Ukrainian Botanical Review, Kieff, U. S. S. R.
White Ruthenian Lenin's Institute of Agriculture and Forestry, Minsk, U. S. S. R. *Bulletin.*
Zaklad Badania Drzew i Lasu. Krakow, Poland.

Respectfully submitted,

SARAH H. HĀRLOW,
Librarian

REPORT OF THE PALEOBOTANIST

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I have the honor to report as follows upon matters that have received my attention during the year 1929:

The principal items completed were:

(a) Descriptions of new species of fossil plants from the Tertiary shales near De Beque, Colorado. An abstract of the paper prepared on the subject was presented at the Garden Conference on January 16 and the paper was published in the *Bulletin of the Torrey Botanical Club* for February.

(b) Descriptions of new Tertiary cycads from Alaska, with a review of Tertiary cycads in general. An abstract of this work was presented at the Garden Conference on November 13 and the completed manuscript was subsequently transmitted for publication as a Memoir of the Garden.

(c) Final pages of the manuscript of the joint work with Doctor Britton, on our revised flora of Staten Island, were edited in preparation for printing.

Items relating to work under way and partly completed are:

(a) Studies of Triassic plants in the museum collection of the Staten Island Institute of Arts and Sciences, including descriptions and illustrations of new species.

(b) Preliminary examinations of paleobotanical material representing accessions to the museum collection of the Garden, including about sixty specimens of Tertiary plant-remains from Cuba, donated by Brother León and recorded under accession No. 27, lot No. 59; lignite, with worm or insect borings from the Cretaceous of New Jersey, clay concretions containing leaf impressions from the Cretaceous of Long Island, and clay containing plant remains from a supposed glacial pond deposit on Staten Island, donated by Miss F. C. Jud and recorded under accession No. 28, lot Nos. 60, 61, 62, respectively.

Miscellaneous activities included translations of paleobotanical articles from French and German literature for *Biological Abstracts;* preparation of abstracts of paleobotanical papers for the *Revue de Géologie;* preparation and delivery of three lectures in the stated Garden courses; attendance at (a) the formal opening of the Buffalo Museum of Science, January 19, (b) the semi-centennial celebration of the organization of the United States Geological Survey in Washington, March 21, and (c) the winter meeting of the Paleontological Society of America in Washington, December 26-28.

Two days (April 29 and May 13) were spent in field work on Staten Island, New York, collecting plants of the serpentinoid area on Todt Hill and vicinity, partly for the herbarium and partly for the Rock Garden. Also five days (August 6-10) in Ulster County, New York, studying the flora of the sand plains in the vicinity of Tillson, and the flora of the valley of Rondout Creek. About forty of the characteristic species of the region were collected for the local herbarium of the Garden.

Library accessions of paleobotanical literature greatly exceeded in number those of any previous year. The record includes 128 separate pieces, of which 80 were obtained by purchase, 47 by exchange, and 1 as a donation. Among the works obtained by purchase are 28 by authors not before represented in the library, and 11 new authors were added to our exchange list.

On request of the Department of Geology of Barnard College, we supplied, from duplicate material, typical specimens to illustrate the extinct "Glossopteris flora" of the Old World.

Respectfully submitted,

ARTHUR HOLLICK,
Paleobotanist

REPORT OF THE SUPERINTENDENT OF BUILDINGS AND GROUNDS

DR. M. A. HOWE, ACTING DIRECTOR.

Sir: I have the honor to submit the following report for the year 1929:

REGULATING AND GRADING

During the past year considerable regulating and grading of the paths of the Garden has been accomplished. This was at the southern end of the Hemlock Grove, at the eastern side of the Bronx River, from the entrance at Linnaeus Bridge to Bronx Park East, and through the Oak Collection. During the year seven men and three carts were assigned to the work of filling in the Long Lake. We moved about 2,700 cubic yards of fill.

DRAINAGE

Repairs were made to the culvert from the Herbaceous Grounds through the Iris Garden. Three culverts were built under the path near the Bronx River.

WATER SUPPLY

The water systems of the Museum Building, Conservatory Ranges Nos. 1 and 2, the Propagating House, the Stable, the Power Houses Nos. 1 and 2, and all of the drinking fountains around the ground received extensive repairs.

MEMORIAL BENCH

All necessary excavation, filling, grading, and sodding were done by our men for the Elizabeth Bigelow Estes Memorial Bench, and coöperation was furnished to the contractor throughout the work.

PATHS

In order to connect the Linnaeus Bridge Entrance with the Lilac Garden and Bronx Park East, two paths were built. One path 10 feet wide, 526 feet long, and one path

10 feet wide, 856 feet long. Through the Oak Collection a path 10 feet wide, 903 feet long, was built.

To connect the Picnic Ground with the Hemlock Grove, a path 10 feet wide, 725 feet long, was built. The paths leading to the Elevated Railway Entrance, Conservatory Range No. 1, Museum Building, Iris Garden, and Japanese Cherry Collection were given a coat of Tarvia and a light cover of ashes.

BUILDINGS

At the Museum Building, the steam and water systems and the window sashes and doors received necessary repairs. Two coats of paint were given to the main hall on the second floor of the building. Twelve herbarium cases were built for the herbarium.

At the Conservatory Range No. 1, the interior and exterior of Houses 2 and 3 received two coats of paint; the glass and sash bars were removed and replaced; all the copper leaders of Houses 2 and 3 were replaced. At House 6, four concrete benches were installed, the total in length being about 80 feet and 3 feet 6 inches wide. One planting bench built of concrete 9 inches deep 5 feet wide and 58 feet long was made at Range No. 2, over cellar runway. The broken glass at Conservatory Ranges 1 and 2 and at the Propagating House was replaced by the painters.

All the necessary repairs to the steam system to the Museum Building, Conservatory Ranges 1 and 2, Power Houses 1 and 2, and the trenches were made by our engineers.

All repairs to plumbing and water system were made by our plumber.

GROUNDS

We have built and distributed on the grounds 110 concrete benches, 7 feet long and 2 feet wide.

A wire fence 7 feet high, 574 feet long, with 3 gates 12 feet wide, was built to protect the hay barrack.

A wire fence 7 feet high, 557 feet long with 2 gates 12 feet wide was built to protect the leaf-mound yard.

Also, on the western side of the Bronx River near the southern boundary, 1,937 feet of two-rail fence and 650 feet of one-rail fence. Around the hill, south of the Hemlock Grove, a two-rail fence 1,113 feet long. At the Herbaceous Grounds, 520 feet of two-rail, at the western side of Conservatory Range 1, 350 feet of one-rail fence.

Around the maples and Sorbus near Cherry Valley, 1,735 feet of two-rail fence.

At the Elm Collection, 385 feet of two-rail and 476 feet of one-rail fence were built.

All the one and two-rail fences received two coats of paint.

Repairs were made to the one and two-rail and cedar fences. The maps and signs were repaired or replaced wherever necessary. A coldframe of brick, 3 feet deep, 6 feet wide, 47 feet long, at the nursery was built.

On the eastern border around Bronx Park East, where the street is to be widened 40 feet, 2,500 yards of topsoil were removed and placed in several convenient places.

The Propagating Houses were supplied with fuel for four months from wood cut from dead or fallen trees. About forty tons of hay were cut during the summer months. The quarry at the Museum Building was worked for three months to supply stone for new path work.

From May until September about a dozen picnics a week visited the Garden. The parties included from 75 to 600 children each. These children attended public, private, and Sunday schools of Greater New York, Long Island, New Jersey and Connecticut, and were escorted to the picnic ground of the Garden by our special guards, who are assigned to these grounds daily during the summer months.

During the past year four uniformed police officers were assigned to the Garden from ten in the morning until six in the evening. They were assisted by two officers in civilian clothes. On Sundays and holidays, fifteen guards selected from the gardeners and laborers assisted the keepers in patrolling the grounds. About 275 summonses were served by the police officers for violations of park ordi-

nances. The offenders were arraigned in the Magistrates' Courts and were fined from one to ten dollars each.

For twenty-four hours every day, special guards were assigned to the rose, gladiolus, and dahlia collections during the summer months.

Due to the watchfulness of our employees, very little damage has been done to the plantations throughout the grounds.

Respectfully submitted,

ARTHUR J. CORBETT,

Superintendent of Buildings and Grounds

REPORT OF THE HONORARY CURATOR OF THE ECONOMIC COLLECTIONS

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: I have the honor of submitting the following report of the Economic Collections for the year 1929.

Except for a considerable amount of labeling and relabeling of specimens, the work of the year has been chiefly of a routine character, but much thought has been given to plans for extending the usefulness of the Economic Museum, especially in its educational features.

In its present condition, the Museum consists of a decidedly extensive collection of specimens, well classified and grouped, and bearing labels which state the name of the product, the name of the plant yielding it, and its family, the nativity of the plant, the geographical source and the method of acquisition of the specimen. In many cases, descriptive group labels have been placed in the midst of a group of related specimens, each of which also bears its individual label. Space requirements forbid the use of large type on these group labels, as the result of which it is not easy to read them from outside the case. In a number of cases, large pictures have been installed with the specimens, but there is space for only a limited number of such illustrations.

The educational value of our collection, even with this meagre accompaniment of descriptive matter, should not be underestimated. Many thousands of children of the schools of New York and vicinity, coming separately or in classes, have visited the Museum with interest and profit, but to the careful observer, the hunger of these children for more information has been more impressive than their satisfaction with what they have received. Your reporter is most anxious and earnest in his recommendation for some decided improvement in these conditions.

The following recommendations are, in the main, those made in one of my earliest reports, but our financial condi-

tions have not, up to the present, permitted them to be carried out.

The employment of such elaborate displays as those employed in the American Museum of Natural History, the Field Museum and others is highly desirable, but would call for large expenditures and also for a large increase in our available space, but important improvements can be made by a very moderate expenditure.

My principal recommendation is that carefully written descriptive leaflets or tracts should be supplied, explaining in simple and interesting language the origin, history and nature of special products, such as rubber, cotton, linen and other fibers, certain groups of cultivated fruits and fruits not yet introduced to cultivation, sugars, starches, perfumes, cereals, drugs, medicines, fixed oils, nuts, etc. Such a tract might cover only one or two printed pages, or might run into a considerable number of pages. They should be supplied in such a form, preferably with a special binder, that the recipient could preserve them in collective form.

The most important consideration would be the method of distribution. I am strongly of the opinion that they should be paid for by the recipient. If supplied gratis, there would be a great wastage and, more important, interest in them would be lessened. Moreover, when paid for, they would be taken in small numbers and would be more carefully read, and interest in obtaining others would thus be stimulated. The price, of course, should be not more than, or even less than cost. The easiest method of distribution would be by sale at the desk. But this method would certainly curtail success to some extent. Some form of slot machine, located at the end of the case concerned, would probably be the most efficient method, although the cost of installation of such machines would be considerable. A sample copy of the tract should be conspicuously displayed in connection with the exhibit to which it refers. It would not be possible for us to install a complete set of such tracts at one time, nor would such a course be the most desirable,

but a few products could be treated at once and the results observed. In many if not most cases, the articles could first be published in the Garden *Journal* and the pages electrotyped for use in printing the tracts.

In many cases, and wherever practicable, the botanical origin of our economic products has been authenticated by the collection of identification material from the same individual plant from which the sample was procured. It is obvious that this very desirable course cannot often be followed in the case of samples obtained from commercial sources. One of my recommendations is that in future more effort and expenditure shall be devoted to the extension of this method.

There is another great improvement in the exhibits themselves that should be undertaken when the necessary means are available, namely the illustration of processes, not necessarily complete, but carried sufficiently far to illustrate the relation between the crude and manufactured product. As an illustration, I will refer to a drug and medicines prepared from it. There is probably but a small percentage of the public who know of the relation between strychnine and nux vomica, or between quinine and cinchona. Fewer still know the relations between the extract, fluid-extract, tincture, syrup, alkaloid, etc., produced from a drug, yet such information is of great practical importance and often vital. The fact that a certain tincture is only one-tenth as strong as the fluid-extract and the latter only a fifth as strong as the extract, makes the latter fifty times as strong as the tincture, yet the ignorant patient may take the extract in a dose as large as that of the tincture. The alkaloid itself may be ten times as strong as the extract. In illustrating such a subject as this, we could take an entire case for a single drug and its preparation. We could show a powdering apparatus in miniature, a percolator as though in operation, the different preparations in proportional amounts to indicate their strength, an extraction apparatus for alkaloids and the resulting alkaloids, crude and purified.

Quite a number of other classes of products would lend themselves to a similar treatment and popular interest in the subject would be greatly enhanced thereby.

H. H. RUSBY,

Honorary Curator of the Economic Collections

REPORT OF THE HONORARY CURATOR OF MOSSES

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Dear Sir: During the year, the transfer of the herbarium of cultivated plants to the second floor has afforded much needed space for storing the remnants of the Mitten Herbarium, which had been stacked on top of the cases in the storeroom in an inaccessible place. This will enable us to select such duplicates as are of value for exchange and reject those whose labels have been lost or were missing when the collection was bought.

The mounting of the George N. Best collection has been completed, making a total of 7,022 specimens from this source. The duplicates have been sent to Mr. E. B. Bartram.

Progress has been made in mounting the collections donated to us by Mr. Eugene A. Rau, which included, besides 4,997 moss specimens, quite a number of lichens, algae, and flowering plants.

Our correspondents have continued to send us mosses for determination from Cuba, Jamaica, Trinidad, and a notable addition has been made from the Tyler-Tate expedition to Mt. Duida, in the State of Bolivar, Venezuela, from which many rare species have been determined by Mr. Williams, as well as others from various parts of South America, including Peru, and the Sandwich Islands. As Mr. Bartram is spending the winter in Hawaii, many additions of interest may be expected.

At the request of Dr. Forman T. McLean, Supervisor of Public Instruction, I assisted Mrs. Van Brunt in the selection of about 200 lantern slides of North American plants and a few horticultural varieties, which has added greatly to the value of the slide collection.

Letters of inquiry and applications for literature on Conservation continue to be received and the Stokes Fund for

the Preservation of our Native Plants continues its good work and occasional lectures to Garden Clubs and schools are still being given.

Respectfully submitted.

ELIZABETH G. BRITTON,

Honorary Curator of Mosses

REPORT OF THE HONORARY CUSTODIAN OF THE LOCAL HERBARIUM

DR. MARSHALL A. HOWE, ACTING DIRECTOR-IN-CHIEF.

Sir: Various accessions on hand were prepared for mounting and subsequently distributed.

Loans from the Local Herbarium were sent out and on their return checked and redistributed in the herbarium.

The work done during the year 1929 has been largely on the Bicknell collection, most of which has been temporarily stored, for greater safety, in four new herbarium cases which were apportioned to this department during the summer.

The pre-sorting of the unmounted Bicknell specimens was carried on as usual, families Diapensiaceae to Cichoriaceae, inclusive, being prepared. The Compositae alone fill twenty-six pigeonholes of a standard herbarium case.

The recording and label-writing of this material covered the range Vacciniaceae, in part, to Solanaceae, bringing the total of specimens prepared in the Bicknell collection to 12,543 to date.

The sorting of the genus *Carex*, done in 1926, has now been completed by the recording and writing of the labels, amounting to 2,733.

A collection of approximately 1,400 unmounted dicotyledons, collected by Dr. F. W. Pennell during the period 1915-1921 and now received by the Local Herbarium, brings the accessions for 1929 up to 1,462.

Respectfully submitted,

H. M. DENSLOW,

Honorary Custodian of the Local Herbarium

REPORT OF THE CHAIRMAN OF THE SCIENTIFIC DIRECTORS

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen: The Scientific Directors have held during the year their regular meetings and a number of specially called meetings. The year has witnessed the first change in the directorship of the Garden since its founding in 1895. Dr. Nathaniel L. Britton, having reached his seventieth year, presented his resignation as Director-in-Chief in order that he might be free to devote his time more fully to his scientific work. The Scientific Directors, after numerous conferences and a careful consideration of the available candidates, on July 8th accepted Dr. Britton's resignation to take effect August 1st and appointed Dr. Elmer Drew Merrill to succeed him. Dr. Merrill accepted, with the understanding that he would take up his new duties on January 1, 1930.

In recognition of his long and distinguished service to the Garden, Dr. Britton was made Director Emeritus of the Garden, and Associate Curator Mr. Percy Wilson was assigned to serve as his research assistant. A committee, consisting of Dr. Henry H. Rusby and the Chairman, was appointed to prepare a minute expressing the high appreciation of the Scientific Directors for the long and devoted service of Dr. Britton. This minute is printed in the January number of the Garden *Journal*.

Dr. Merrill comes to his new post with a record of highly successful service as a botanist, plant geographer, and executive in the Philippines, and as Dean of the College of Agriculture of the University of California.

Assistant Director Dr. Marshall A. Howe has served as Acting Director-in-Chief during the period between the retirement of Dr. Britton and the arrival of the new Director.

Two Scientific Directors have been added to the Board during the year. Mr. Barrington Moore was elected to

membership in 1924 but, owing to the special quorum required, this action was not confirmed until the present year. Dr. Daniel Trembly MacDougal of the Carnegie Institution, formerly Director of The Laboratories and Assistant Director of the Garden, was also elected to membership in the Scientific Directors and his election was duly confirmed by the Board of Managers. A further change in our statutory membership comes with the retirement of Dr. Herbert M. Denslow and the election of Dr. Edmund W. Sinnott, Professor of Botany in Barnard College, to the Presidency of the Torrey Botanical Club. We heartily welcome these gentlemen to the service of the Garden.

Our retiring colleague, Dr. Denslow, has been a life-long friend and benefactor of the Garden and we are all deeply indebted to him for his unfailing helpfulness and good will in the work of the Scientific Directors.

Respectfully submitted,

R. A. HARPER,

Chairman of the Scientific Directors

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1929

EXHIBIT I

B A L A N C E S H E E T

December 31, 1929

JOHN L. MERRILL, Treasurer

ASSETS

Permanent Fund Assets:			
Investments (Exhibit III)	$2,369,287.62		
Cash awaiting investment	5,257.02		
		$2,374,544.64	
Balance of permanent fund assets expended for current uses (See current fund liability per contra)		39,756.93	
			$2,414,301.57
Current and Working Assets:			
Cash in banks and on hand:			
For account of life beneficiary..	$ 1,221.30		
Special purposes	17,900.55		
		$ 19,121.85	
Account receivable — City maintenance	41,620.72		
Interest and dividends receivable (Exhibit III)	31,235.82		
Prepaid insurance premiums	769.19		
		92,747.58	
			$2,507,049.15

EXHIBIT I
BALANCE SHEET
December 31, 1929

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 195,753.47	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,199,722.21	
Special endowment, with life interest in respect of income therefrom		18,825.89	
			$2,414,301.57
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable	$ 4,604.81		
Income due to life beneficiary	1,221.30		
		$ 5,826.11	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 4,271.85		
Unexpended contributions set aside by the Board of Managers for specific purposes	13,628.70		
		17,900.55	
Deferred income credits:			
Membership dues paid in advance	$ 350.00		
Subscriptions paid in advance	727.50		
		1,077.50	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses		39,756.93	
Surplus:			
Surplus at December 31, 1928	$ 21,904.32		
Add—Excess of income over expenditures for the year ending December 31, 1929 (Exhibit II)	6,282.17		
		28,186.49	
			92,747.58
			$2,507,049.15

CERTIFICATE OF AUDITORS

We have examined the books and accounts of The New York Botanical Garden for the year ending December 31, 1929, and certify that the attached balance sheet (Exhibit I) and relative statements (Exhibits II-V inclusive) are correctly prepared therefrom, and, in our opinion, set forth fairly the financial position of the corporation as at December 31, 1929, and the transactions for the year ending on that date.

PRICE, WATERHOUSE & Co.

56 Pine Street, New York, March 19, 1930.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1929

	City maintenance	General	Restricted and special funds	Total
Income:				
Income from investments of permanent funds....		$121,422.47	$ 9,907.19	$131,329.66
Contributions	$256,415.00	440.00	6,100.00	262,955.00
Membership dues:				
Annual		16,933.00		16,933.00
Sustaining		525.00		525.00
Sale of duplicate books and sundries		13.10		13.10
Subscriptions and sales of publications		3,796.53	2,439.05	6,235.58
Total income	$256,415.00	$143,130.10	$ 18,446.24	$417,991.34
Expenses:				
Maintenance and general expenses:				
Salaries of Director-in-chief, assistants and garden staff	$180,914.95	$ 69,878.20	$ 6,200.00	$256,993.15
Wages	29,390.00	33,552.95		62,942.95
Materials and supplies.	46,110.05	9,263.72		55,373.77
Stationery, printing, postage, etc.		4,508.62		4,508.62
Interest and exchange..		350.17		350.17
Insurance		1,632.47		1,632.47
Miscellaneous		3,412.05	260.70	3,672.75
	$256,415.00	$122,598.18	$ 6,460.70	$385,473.88
Improvements and exhibits:				
Improvements to buildings and grounds		$ 940.00		$ 940.00
Museum equipment purchased		2,121.10		2,121.10
Laboratory equipment purchased		936.89		936.89
Library books, binding, etc.		992.30	$ 3,271.31	4,263.61
Library equipment purchased		116.75		116.75
Museum specimens		367.83	500.00	867.83
Plant purchases and expenses			1,288.49	1,288.49
Botanical exploration and collections		841.76	100.00	941.76
Maintenance equipment purchased		1,526.87		1,526.87
		$ 7,843.50	$ 5,159.80	$ 13,003.30
Education and research:				
Public lectures and instruction			$ 3,753.83	$ 3,753.83
Scholarships, prizes, etc...		$ 72.62	327.38	400.00
Publications		6,108.63	5,782.91	11,891.54
Research		225.00		225.00
Investigation and preservation of native plants ..			268.58	268.58
		$ 6,406.25	$ 10,132.70	$ 16,538.95
Total expenses	$256,415.00	$136,847.93	21,753.20	415,016.13
Excess or deficiency of income for the year		$ 6,282.17*	$ 3,306.96†	$ 2,975.21*

* Excess. † Deficiency.

EXHIBIT III

Summary of Investments, December 31, 1929

	Par value (No par value stocks at book value)	Approximate market value	Book value	Accrued interest and dividends Dec. 31, 1929	Average yield for year on basis of	
					Market value %	Book value %
General funds:						
Bonds	$ 557,800.00	$ 543,916.25	$ 547,801.95	$ 7,475.50	4.94	4.90
Stocks—						
Preferred ...	63,500.00	74,724.34	71,310.00	862.50	5.34	5.60
Common	35,040.68	54,397.25	35,040.68	255.50	2.76	4.29
	$ 656,340.68	$ 673,037.84	$ 654,152.63	$ 8,593.50	4.80	4.94
Sage Fund:						
Bonds	$ 517,000.00	$ 494,474.25	$ 463,641.81	$ 9,391.24	5.06	5.39
Stocks—						
Preferred ...	146,500.00	184,011.05	164,898.76	1,356.25	5.09	5.75
Common	73,300.00	273,730.00	106,063.14	1,801.50	3.25	8.38
	$ 736,800.00	$ 952,215.30	$ 734,603.71	$12,548.99	4.56	5.90
Special Endowment Fund:						
Bonds	$ 19,000.00	$ 18,976.25	$ 19,398.50	$ 395.83	5.01	4.90
Stocks—						
Preferred	360,000.00	465,847.50	434,831.88	4,800.00	5.06	5.42
Common ...	9,000.00	11,160.00	9,900.00	135.00	4.84	5.45
	$ 388,000.00	$ 495,983.75	$ 464,130.38	$ 5,330.83	5.05	5.39
John D. Rockefeller, Jr. Fund:						
Bonds	$ 201,000.00	$ 193,967.50	$ 200,760.25	$ 2,312.50	5.18	5.00
Preferred stocks	254,137.50	327,337.50	298,825.01	2,450.00	4.95	5.42
	$ 455,137.50	$ 521,305.00	$ 499,585.26	$ 4,762.50	5.04	5.25
Special Trust Fund:						
Common Stock	$ 16,815.64	$ 52,923.00	$ 16,815.64		2.68	8.42
	$2,253,093.82	$2,695,464.89	$2,369,287.62	$31,235.82	4.77	5.42

Investments: Summary of Average Yields for Year

	On basis of Market Value	On basis of Book Value
Bonds	5.02%	5.10%
Stocks:		
Preferred	5.05	5.49
Common	3.15	7.36
	4.77%	5.42%

EXHIBIT IV

Statement of Permanent Funds, Showing Changes during the Year Ending December 31, 1929

	Balance at Jan. 1, 1929	Additions	Transfers	Balance at Dec. 31, 1929
Restricted endowments:				
Endowment for science and education	$ 89,115.49			$ 89,115.49
Addison Brown Fund.	21,149.31			21,149.31
John Innes Kane Fund	35,347.63			35,347.63
Maria DeWitt Jesup Fund	25,000.00			25,000.00
Olivia E. and Caroline Phelps Stokes Fund.	3,000.00			3,000.00
Charles Budd Robinson Fund	755.04			755.04
The H. H. Memorial Fund	5,000.00			5,000.00
Alexander P. Anderson and Lydia Anderson Fund	5,000.00	$ 5,000.00		10,000.00
Students' Research Fund		380.00	$6,006.00	6,386.00
	$ 184,367.47	$ 5,380.00	$6,006.00	$ 195,753.47
Unrestricted endowments:				
Endowment Fund	$ 230,293.06	$ 250.00		$ 230,543.06
David Lydig Fund	34,337.86			34,337.86
Students' Research Fund	6,006.00		$6,006.00*	
William R. Sands Fund	10,000.00			10,000.00
Darius Ogden Mills Fund	48,099.17			48,099.17
Henry Iden Fund	10,000.00			10,000.00
Fanny Bridgham Fund	30,000.00			30,000.00
Francis Lynde Stetson Fund	25,000.00			25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	774,298.14	880.64		775,178.78
Frances Griscom Parson Fund	2,304.67			2,304.67
Special Endowment Fund	463,772.33	100.00		463,872.33
The John D. Rockefeller, Jr. Fund	500,000.00			500,000.00
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34			19,636.34
The James A. Scrymser and Mary G. Scrymser Fund	12,750.00			12,750.00
The George N. Best Fund	3,000.00			3,000.00
Mary A. Dill Bequest.		10,000.00		10,000.00
James B. Ford Bequest		25,000.00		25,000.00
	$2,169,497.57	$36,230.64	$6,006.00*	$2,199,722.21
Special endowments:				
Special Trust Fund	$ 17,471.20	$ 1,354.69		$ 18,825.89
	$2,371,336.24	$42,965.33		$2,414,301.57

**Transfer from Unrestricted Endowments to Restricted Endowments*

EXHIBIT V

SPECIAL FUNDS

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance Jan. 1, 1929	Additions	Expenditures	Balance Dec. 31, 1929
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 165.13	$ 4,568.52	$ 4,733.65	
Addison Brown Fund:				
Publication of "Addisonia"		3,520.57	3,520.57	
John Innes Kane Fund:				
Plant purchases and expenses	992.87	1,812.10	1,288.49	$ 1,516.48
Maria DeWitt Jesup Fund:				
Botanical collections and binding of books	1,361.62	1,284.33	1,300.00	1,345.95
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	551.60	153.80	268.58	436.82
Charles Budd Robinson Fund:				
Exploration	76.48	38.71	100.00	15.19
The H. H. Memorial Fund:				
Development of model gardens	228.71	256.33	160.70	324.34
Alexander P. Anderson and Lydia Anderson Fund:				
Research and publications	248.57	384.50		633.07
Students' Research Fund:				
Scholarships and prizes		327.38	327.38	
	$ 3,624.98	$12,346.24	$11,699.37	$ 4,271.85
Special funds contributed for specific purposes:				
Contributions of Trustees of Carnegie Corporation for program of public education	$12,582.53	$ 6,000.00	$ 9,953.83	$ 8,628.70
Bequest of William Gilman Thompson, designated by Executive Committee for construction of shelter house	5,000.00			5,000.00
Bequest of Katherina Evseroff Maryson, designated by Executive Committee for purchase of benches		100.00	100.00	
	$17,582.53	$ 6,100.00	$10,053.83	$13,628.70
	$21,207.51	$18,446.24	$21,753.20	$17,900.55

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1929

The number of new members who have qualified is 176. The number of annual members is now 1,813, a net increase of 46 during the year. Life members 118; sustaining members 20.

Of the annual members 117 are now in arrears for dues for 1929, 43 for dues for 1928 and 1929, 14 for dues for 1927, 1928 and 1929, 1 for dues for 1926, 1927, 1928 and 1929.

Dues have been collected to the amount of $17,338.

One person has qualified as a life member by the payment of $250. These sums have been transmitted to the treasurer.

A complete list of all classes of members to date is herewith submitted.

BENEFACTORS

Edward D. Adams,
*Mrs. Fanny Bridgham,
*Hon. Addison Brown,
*Andrew Carnegie,
Columbia University,
*Hon. Charles P. Daly,
*James B. Ford,
Daniel Guggenheim,
Murry Guggenheim,
Edward S. Harkness,
*Mrs. John Innes Kane,
*D. O. Mills,
*J. Pierpont Morgan, Sr.,
J. Pierpont Morgan,
John D. Rockefeller,
John D. Rockefeller, Jr.,
*Mrs. Russell Sage,
*Francis Lynde Stetson,
*Cornelius Vanderbilt.

PATRONS

Oakes Ames,
Alexander P. Anderson,
Mrs. Alexander P. Anderson
George F. Baker,
*Miss Catherine A. Bliss,
Dr. N. L. Britton,
*Hon. Addison Brown,
*Andrew Carnegie,
*Mrs. George Whitfield Collord,
*Mrs. Louisa Combe,

* Deceased.

*James M. Constable,
*Charles Deering,
Henry W. de Forest,
Dr. Robert W. de Forest,
*Miss Mary A. Dill,
*William E. Dodge,
*James B. Ford,
*George J. Gould,
Edward S. Harkness,
*Mrs. Esther Herrman,
Frederick Trevor Hill,
Archer M. Huntington,
*Henry Iden,
*Mrs. Helen C. Inslee,
*Mrs. John Innes Kane,
*John Stewart Kennedy,
*Mrs. Mary J. Kingsland,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
*J. Pierpont Morgan, Sr.,
*Oswald Ottendorfer,
*Lowell M. Palmer,
*William Rockefeller,
*William R. Sands,
*William C. Schermerhorn,
Mortimer L. Schiff,
*James A. Scrymser,
*Mrs. Mary C. Scrymser,
Mrs. Finley J. Shepard,
*Samuel Sloan,
*Mrs. Frederick F. Thompson,
*Dr. W. Gilman Thompson,
*W. K. Vanderbilt,
Mrs. Antoinette Eno Wood.

* Deceased.

Fellows for Life

Edward D. Adams,
J. E. Aldred,
George F. Baker,
Miss Elizabeth Billings,
Dr. N. L. Britton,
Mrs. N. L. Britton,
Mrs. Andrew Carnegie,
James W. Cromwell,
Mrs. W. Bayard Cutting,
Dr. Robert W. de Forest,
Childs Frick,
Daniel Guggenheim,
Murry Guggenheim,
S. R. Guggenheim,
William Halls, Jr.,
Mrs. William L. Harkness,
Mrs. John Stewart Kennedy,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
William J. Matheson,
J. Pierpont Morgan,
Mrs. Lewis R. Morris,
Mrs. George W. Perkins,
E. A. Richard,
Mrs. John A. Roebling,
Mortimer L. Schiff,
Leon Schinasi,
Mrs. Arthur H. Scribner,
Mrs. John T. Terry,
Charles G. Thompson,
Louis C. Tiffany,
Tiffany & Company,
Felix M. Warburg,
Mrs. William H. Woodin.

Life Members

Edward D. Adams,
Dr. Felix Adler,
Dr. S. T. Armstrong,
Edward W. C. Arnold,
Mrs. Hugh D. Auchincloss,
Dr. John Hendley Barnhart,
George D. Barron,
Aurel Batonyi,
Gustav Baumann,
Henry Rogers Benjamin,
Samuel R. Betts,
William G. Bibb,
Miss Elizabeth Billings,
Mrs. Robert Woods Bliss,
George Blumenthal,
G. T. Bonner,
Mrs. Addison Brown,
Mrs. Andrew Carnegie,
T. Morris Carnegie,
Miss Marian Roby Case,
Frank R. Chambers,
Hugh J. Chisholm,
Hugh J. Chisholm, Jr.,
George C. Clark,
Banyer Clarkson,
Dr. James B. Clemens,
William F. Cochran,
W. R. Coe,
William Colgate,
Miss Georgette T. A. Collier,
W. E. Conner,
S. Wilbur Corman,
R. N. Cranford,
Melville C. Day,
Mrs. John Ross Delafield,
Rev. H. M. Denslow,
W. B. Dickerman,
Miss Josephine W. Drexel,
Isaac W. Drummond,
Miss Ethel DuBois,
William A. DuBois,
George E. Dunscombe,
Mrs. William K. du Pont
Thomas Dwyer,
Mrs. Thomas A. Edison,
Ambrose K. Ely,
Dr. John F. Erdmann,
Edward J. Farrell,
William C. Ferguson,
Marshall Field,
Mrs. H. J. Fisher,
Charles R. Flint,
Eugene G. Foster,
Mrs. John French,
Childs Frick,
Daniel Guggenheim,
Bernard G. Gunther,
Franklin L. Gunther,
Charles J. Harrah,
R. Somers Hayes,
John Hubbard,
Archer M. Huntington,
Frank D. Hurtt,
James H. Hyde,
Mrs. Columbus O'D. Iselin,
Miss Annie B. Jennings,
Mrs. David J. Kelley,
Nathaniel T. Kidder,
Wheaton B. Kunhardt,
Charles Lanier,
W. V. Lawrence,
Mrs. George Lewis,
Joseph Loth,
Edgar L. Marston,

William J. Matheson,
C. W. McAlpin,
Dr. George N. Miller,
A. G. Mills,
Mrs. William F. Milton,
Dr. Lewis R. Morris,
Newbold Morris,
Sigmund Neustadt,
A. Lanfear Norrie,
Gordon Norrie,
Mrs. Charles Tyler Olmstead,
William Church Osborn,
W. H. Perkins,
Curt C. Pfeiffer,
Gustavus A. Pfeiffer,
M. Taylor Pyne,
Miss Florence E. Quinlan,
John J. Riker,
J. C. Rodgers,
Mrs. Herbert L. Satterlee,
Edward C. Schaefer,
Mortimer L. Schiff,
Mrs. I. Blair Scribner,
George Sherman,
James Shewan,
Miss Marion Smith,
Dr. Nelson Smith,
James Speyer,
Miss Ellen J. Stone,
Albert Tag,
Paul G. Thebaud,
Charles G. Thompson,
Robert M. Thompson,
William Thorne,
Oswald W. Uhl,
Miss Anna Murray Vail,
F. T. Van Beuren,
Mrs. Cornelius Vanderbilt,
F. M. Warburg,
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S. D. Webb,
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VOL. 14 No. 53

BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

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BULLETIN
OF
The New York Botanical Garden

Vol. 14 No. 53

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1930

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:

My appointment as Director-in-Chief of The New York Botanical Garden and as Secretary of the Board of Managers, to succeed Dr. N. L. Britton, became effective January 1, 1930. During the year that has elapsed much attention has been given to the various matters appertaining to the Garden, its present condition, its problems, its program and its development. While reasonable progress has been made, major items demanding attention have had to be left in abeyance, because of lack of funds.

Much has been done appertaining to the improvement of the grounds and repairs to buildings, and certain important projects have been consummated. Some details regarding these are given under the several subject matter headings in this report.

The early displays of bulb plants have been well maintained. The extensive Narcissus plantings surpassed the exhibits of former years, as with one exception all varieties in the large naturalistic plantings proved to be adapted to our local conditions, while the number of plants in flower was largely increased over previous years.

The Iris collections have been given special attention, and are now in excellent condition. Many were replanted and much consideration has been given to the elimination of diseased plants.

The Rose display was unusually good, in part because of favorable climatic conditions, in part because of the critical

attention that was given to the control of various pests and diseases.

The Dahlia collection, with about 1,100 plants representing nearly 400 named varieties in one planting, was unusually attractive. The fall exhibit was the most successful one since that feature was added, largely because of the selection of a new area for the Dahlia Border, plus the constant supervision given by Dr. Howe.

The Gladiolus plantings, with more than 10,000 plants representing about 1,000 varieties, under the supervision of Dr. McLean, were eminently successful. At the time the Gladioli were in full bloom the Metropolitan Gladiolus Society held its annual exhibition in the Museum Building, August 23 and 24, with better exhibits and better attendance than in any previous years.

Extensive temporary plantings of hybrid Day-lilies have been made immediately north of the Museum Building; after selections have been made the retained forms will be transferred elsewhere. It is planned to develop in the near future a large naturalistic planting of Day-lilies near the Fordham Hospital grounds.

The most striking change that has been made has been the removal of the systematic herbaceous beds from the glade extending northward from the Rock Garden, and the replanting of this material as a systematic border along the thicket immediately north of the Museum Building. In its new location these systematic plantings interfere with no landscape features, but rather blend with the thicket they border; probably a greater variety can be grown here than in the glade with its high water table. The systematic plantings in their new location are readily accessible to all who may desire to study these living collections, while at the same time permits can freely be given to qualified individuals to take material for study. The glade will be maintained in lawn as a landscape feature; later it may be desirable to develop formal plantings for mass or color effect.

Through gift, purchase, exploration, and exchange, about

75,400 specimens were added to the permanent and exchange collections, as compared with 16,734 in 1929. The total number mounted and distributed into the herbarium approximates 60,000, far outnumbering the total in any recent year, the corresponding number for 1929 being 14,500. Through assistance secured in coöperation with the Emergency Work Bureau, the accumulated material of past years is now very rapidly being placed in order. During the year about 8,900 duplicates were distributed to other institutions in exchange.

The local herbarium was greatly enriched by the bequest of the Ferguson Herbarium of Long Island plants, estimated to contain about 10,000 specimens. The work of mounting and arranging the special herbaria of mosses, hepatics, algae, and fungi is proceeding rapidly under the individuals in charge of these collections.

In the museum all of the exhibit cases and containers on the first floor have been thoroughly cleaned, and soon similar work will be commenced on the second floor. During the year a section of the California Big-tree, 11 feet in diameter, was secured through Col. John R. White, Superintendent of the Sequoia National Park.

The usual spraying campaigns have been carried out to control scale insects and other pests in the Garden. Highly gratifying results have been secured in the control of certain Iris diseases through the direct application of certain fungicides.

Three new courses for teachers and others with similar interests were initiated—Plant Pathology, Practical Gardening, and the Principles of Systematic Botany. The response to these new courses has been excellent. Attendance at the series of forty afternoon public lectures was approximately 5,250, an increase of about 1,600 over the previous year. Fifteen evening lectures were given in coöperation with the Extension Division of New York University.

The attendance at the winter lectures in the Central Display Greenhouse is so large as to exceed the present

seating capacity. Forty lectures were given before outside organizations, and a number of radio addresses were given during the year by various staff members. Weekly press releases have been sent to a list of about 200 periodicals in and near New York, and much of this material has been extensively utilized.

The number of bound volumes in the library at the close of the year was 41,025, an increase of 1,743. The library, while one of the most important ones in North America within its field, is still inadequate, and an increased grant for the purchase of books is urgently needed. It is highly desirable that a photostat service be added to the resources of The New York Botanical Garden through which it will be possible for us to render a much needed service to botanists everywhere who desire special data from publications available in the library of The New York Botanical Garden; no botanical library at present maintains such a service.

The New York Botanical Garden is and always has been a publishing institution. This work should be maintained and increased. "Addisonia," the "Journal," and "Mycologia" have been issued regularly; one number of the "Bulletin" has been printed; two numbers of the "North American Flora" have been published, and the work on the printing of several others is well advanced.

Dr. Rydberg's "Flora of the Prairies and Plains of Central North America" has been officially accepted by the Garden, to be issued as a special publication, and a considerable number of galley proofs have been revised. The volume will appear some time during 1931 and will form a text of about 900 pages, with numerous illustrations.

A new serial has been authorized, and proofs have been received for the first number. For this, which will to a greater or less degree replace the "Memoirs," the name "Brittonia" has been selected in honor of Dr. N. L. Britton. It is planned to issue the numbers of "Brittonia" at irregular intervals as material for publication and funds for printing become available.

The undersigned, Dr. B. O. Dodge, Dr. A. B. Stout, Dr. H. A. Gleason and Dr. J. H. Barnhart attended the Fifth International Botanical Congress at Cambridge, England, in August as official representatives of The New York Botanical Garden. The undersigned was one of the three American Honorary Vice-presidents and was selected to preside at all meetings of the sections on nomenclature charged with the revision of the International Code of Botanical Nomenclature. The official delegates took part in the proceedings of the Congress and all took advantage of the opportunity to visit other institutions in England and on the Continent in connection with research problems with which each individual was concerned. Dr. Gleason spent a period of six months in connection with his European trip, studying South American material in Berlin, Geneva, and London.

Fees from members formed an important part of the income of the Garden. In spite of adverse economic conditions, 176 new members have been added to our list. Four individuals qualified as life members. The total number of annual members is now 1,827; life members 112; fellowship members 1, sustaining members 20. Dues collected during the year amounted to $17,815.

Taking advantage of the unemployment situation and in coöperation with the Emergency Work Bureau, the situation at the Garden was canvassed early in November with the result that about 90 positions for women were created before the end of December. Through this arrangement a tremendous amount of back work is being finished, and a number of new projects started. Most of the temporary employees have proved to be entirely satisfactory. The work in progress includes a general cleaning of all exhibit cases and containers in the museum; the dusting and cleaning of the palaeontological collections; the cleaning and rearrangement of the living plants in the conservatories; the cleaning and repairing of the mounted herbarium material; the mounting of many thousands of botanical specimens that have been in storage for years, and the distribut-

ing of such material into the reference collections; the cataloging and arranging of all our duplicate books and reprints; the cleaning and dusting of all library books and shelving; and a general revision of our extensive collections of slides and negatives. Some of the temporary employees have been assigned to stenographic work, general clerical work, typing, etc.; others are translating and abstracting technical literature, and others are working as technical assistants in the laboratories. Active work through this unlooked-for general assistance has been commenced on an extensive card index to all published Polynesian botanical binomials and on the preparation of the slips for a comprehensive bibliography of Chinese botany. During the year, and largely within the last two months, approximately 75,000 clippings of original descriptions, critical notes, etc., or typewritten copies of such data have been prepared and actually incorporated in the herbarium in juxtaposition with the actual specimens. This is the first time in botanical history that this very practical and time-saving expedient has been adopted on an extensive and comprehensive scale.

In addition to this inside work the services of about 80 men, from the same source, have been utilized for out-of-door work in the Garden, and a great variety of much needed work is thus being accomplished. The very fact that so many positions could be created on short notice and for productive work that really ought to be done indicates very clearly the handicaps under which this institution has suffered in past years, because of inadequate income, and the inadequacy of our permanent staff to handle all matters promptly and efficiently.

The New York Botanical Garden is distinctly under-financed for the work it is attempting to do and the field it is attempting to cover. There is a vast opportunity for improvement in the general nature and extent of its work in all lines, but after all, little additional constructive work can be even initiated without an increase in income. At present the institution is a static one; in fact, because of

essential salary adjustments made in 1930, all other items have been so dangerously reduced, that unless additional resources become available within a few years, reduction in activities and reduction in staff will be inevitable. The Garden should be changed from a static to a dynamic institution. It is hoped and believed that this objective will be attained, and that in due time this institution will assume its proper place in the very front rank of similar organizations. Institutions are made by men, and the productivity of an institution depends on its personnel and on its income. No special recommendations are made at this time, but the fact is emphasized that if the Garden is to meet the expectations of its friends, reasonably ample additional financial support must be provided. It would be most unwise to attempt to build up any one line of activity at the expense of other departments, but rather we should build for the future on the basis of the existing organization.

The Budget of the City of New York for the year 1931 provides an item of $274,520.00 for salaries and expenses of The New York Botanical Garden, an increase of $3,975.00 over the total city allocation to the Garden for 1930.

Attention is called to the serious fire hazard in the Museum Building. The building itself is of fireproof construction, but this is not true in reference to its contents, especially the exceedingly valuable library and reference collections. For both of these the available space is limited, and both the library and the herbarium are badly crowded. The herbarium was originally established on the basis of wooden cases. During the past year, because of lack of funds, it was necessary to devise special corrugated paper cartons for storage purposes, and the addition of a large number of these has naturally increased the fire hazard. In case a fire started and gained any considerable headway on the upper two floors, it probably could not be controlled. The immensely valuable library and equally valuable reference collections, if lost, could not be replaced.

Other institutions, such as the Gray Herbarium, the

Arnold Arboretum, Cornell University, the Field Museum, the University of Illinois, the University of Minnesota, the University of California and others, have replaced all wooden storage cases by modern steel ones. The replacement cost at The New York Botanical Garden, because of the very extent of our collections, would be high, and in view of the available space in the Museum Building for storage purposes would probably be inadvisable. After due consideration of this matter, involving the present fire hazard, the crowded condition of our library and herbarium and laboratory quarters, and the fact that the space provided for these activities is ill adapted to their special needs, my conclusion is that every effort should be made to secure funds for the specific purpose of erecting a new building for the library, herbarium and laboratory activities of the institution, this to be of modern construction, definitely planned to meet the needs of the above activities, and furnished throughout with modern steel storage cases.

BUILDINGS AND GROUNDS

Mr. Arthur J. Corbett, Superintendent of Buildings and Grounds, reports that during the year a considerable amount of regulating and regrading of paths has been accomplished, particularly along the west side of the Bronx River south of the Hemlock Grove; near the 204th Street entrance and northward along the road on the west bank along the railroad embankment; in the Magnolia collections; at the east side of the Long Bridge, and along the old Mansion Road.

Repairs were made to the culverts at the Long Bridge and one new culvert 150 feet in length was installed. Near the main drive at the 204th Street entrance a new catch-basin was constructed, involving the use of 175 feet of 8-inch drain pipe. Two catch-basins were installed along the University path, this involving the use of 375 feet of 12-inch drain pipe with three man-holes.

The water system of the Museum Building, Conservatory Ranges 1 and 2, Propagating House, Stable, Power Houses

and Comfort Stations and the public drinking fountains received the necessary repairs. Two new drinking fountains were installed—one at the railroad plaza and one near the Allerton Avenue entrance. In the Economic Garden the water supply has been improved by the replacement of the old system with 850 feet of galvanized pipe.

New paths 10 feet in width and totaling 1,700 feet in length were constructed, these improvements for the most part being the connection between the Linnaeus Bridge entrance and the Hemlock Grove, in the vicinity of the 204th Street entrance, and in the Magnolia collection. In addition to these improvements, several hundred feet of previously existing paths were reconstructed. The old Mansion Road was narrowed for a distance of 125 feet, from 20 to 10 feet in width, to be used in the future as a path.

In the Museum Building, the steam and water pipes and the window sashes and doors received repairs as necessary. The entire ceiling of one of the larger rooms on the third floor was replaced. Two offices were provided in the basement by extending the existing walls to the ceiling.

The interior and exterior of Houses 5, 7 and 8, Conservatory Range No. 1, received three coats of paint, the glass and sash bars being removed and replaced. The exterior of House No. 1 received two coats of paint. All copper leaders of Houses 5, 7 and 8 were repaired. The necessary repairs to the steampipe lines and water systems were made by our own engineers and plumbers.

In the Arboretum and in the vicinity of the Cherry collection at Pelham Parkway, 4,160 feet of two-rail and 3,510 feet of one-rail guard fence were installed. The Nursery area was entirely enclosed by a permanent fence 7 feet high with an entrance gate 12 feet in width. Along Bronx Park East, because of activities in connection with the widening of that street, it was necessary to erect a temporary fence 760 feet in length. The fence and path at the University boundary were raised about five feet for a distance of 350 feet, this being rendered necessary be-

cause of grading operations in connection with the fill on Fordham University grounds. All of the boundary fence from the elevated railway entrance to Bronx Park East, and all one-and two-rail guard fences received two coats of paint.

During the latter part of the winter, the work of removing the ledge outcropping northwest of the Museum Building was completed, a task on which work has been done intermittently for the past twenty-five years. This entire area is now in lawn for the first time. Maps and signs were repaired or replaced wherever necessary. About 45 tons of hay were cured during the summer, and through the general winter clean-up of the forested areas, sufficient fuel was provided from dead or fallen trees to operate the Propagating House furnaces for a period of four months.

During the past year, from four to six uniformed police officers were assigned for duty in the Garden. They were assisted by two officers in civilian clothes on Sundays. On Sundays and holidays eighteen guards selected from the gardener and labor staff of the Garden assisted the regular keepers in patrolling the grounds. About 300 summonses were served by police officers for violation of Park ordinances, the offenders being arraigned in the Magistrate's Court. During the growing season special guardians were assigned to the Rose, Gladiolus and Dahlia collections, it being necessary to maintain guards here twenty-four hours each day. Due to the watchfulness of our own employees and the coöperation received from the Police Department, very little damage has been done to plantings in the grounds during the year.

From March 7 to June 27, employment was provided for twenty-five men for five days a week; from July 3 to October 16, eight men; and from October 24 to December 31, eighty men. This extra assistance was financed through the Association for Improving the Condition of the Poor and the Emergency Work Bureau. Through this extra assistance much routine work has been accomplished, particularly in reference to cleaning the grounds, weeding

lawns, grading, preparing material for, and actually constructing paths.

GARDENS

Mr. K. R. Boynton, Head Gardener, reports that under the direction of the same foremen and with the employment of the same gardening force as during the preceding year, the gardening work has proceeded along two lines. First, in removing old plantings in preparation for the establishment of new groups, and second, a general cleaning up preparatory to the rehabilitation of various areas for contemplated improvements.

Adverse atmospheric conditions, particularly in reference to soot and dust, have so affected some of the conifers that it has become necessary to move many specimens from the Pinetum during the year. To a certain extent representatives of deciduous trees and shrubs have been adversely affected, but not to the extent of the evergreens.

To improve the deciduous plantations, the old collection of willows in the Fruticetum has been removed and young plants have been grown in the nursery which will be planted in the early part of 1931. A new area in the north end of the Garden will be developed for the poplars and willows, including hybrid forms in which Dr. Stout and others are interested. It is believed that the soil and moisture conditions in this part of the Garden are much more favorable to the growth of poplars and willows than in other areas.

The herbaceous systematic collection, which was established in the glade extending northward from the Rock Garden more than thirty years ago, has been entirely removed and a new systematic planting of representative families and genera has been made north of the Museum Building, the plants being arranged as a border along the south side of the thicket between the lake and the Museum Building. This planting is designed so that individual groups of plants will produce sufficient flowers and fruits at various seasons so that groups of students, particularly

those of college grade who study this collection under their instructors, can be supplied with laboratory material whenever this is essential.

To improve the Peony collection, material has been acquired through assistance of the Farr Nursery Company, Mr. John C. Wister, George H. Peterson, Inc., Vaughan's Seed Store, Midwest Gardens, and Dr. M. A. Howe, representing 195 good new varieties, in addition to the seedlings sent previously by Professor A. P. Saunders and Colonel J. C. Nichols. This is a beginning toward building up a representative collection of modern Peonies.

The Rose Garden enjoyed a very favorable season; thanks to the constant care and inspection of Dr. Dodge, the plants were free from diseases and insect pests. At the request of Messrs. Bobbink & Atkins the outside border of old hybrid perpetual roses has been removed. They are to be replaced by varieties blooming over a longer season, following the suggestions of Mr. L. C. Bobbink. We are indebted to Mr. Stanley G. Ranger for numerous seeds and plants of many of the better annual and perennial herbaceous plants, including Delphiniums, Lupines, Filipendulas and Poppies.

Coöperation with the International Rubber Company has been continued and fifty rare palms and oil- and rubber-producing species were presented by this organization to the Garden. Early in the fall many of the living plants grown in our greenhouse for the International Rubber Company were shipped to their Sumatra plantations. Dr. J. K. Small secured about six species of Sarracenia, which have been established, while Mr. William H. Webster has supplied excellent living material representing the California pitcher plant, Darlingtonia. It is planned to build up the living collections of insectivorous plants and in this connection a collection of Nepenthes is desirable. Mr. W. R. Coe of Oyster Bay, Long Island, has offered us cuttings from his fine collection of Hibiscus, which will enable us to build up an attractive exhibit of these shrubs.

Through the coöperation of Mr. William H. Webster, a general survey of the entire field of greenhouse flowering

plants is being made and several hundred specimens of free-blooming plants have been secured for the conservatories. Mrs. H. H. Buxton, Secretary of the Federation of Garden Clubs of Massachusetts, has presented to the Garden more than forty kinds of Begonias and is coöperating in the work of classifying this material and in the establishment of a representative collection of the cultivated species of this increasingly popular group. The Garden is indebted particularly to the firms of Bobbink & Atkins in Rutherford, New Jersey, to Stumpp & Walter, and Max Schling of New York, the Farr Nursery Company, Pennsylvania, and the Haarlem Bulb-Growers' Association of Holland for important additions to our horticultural collections and for their assurance of continued support.

Through the assistance of extra labor supplied through the Emergency Work Bureau, all indices to living plants are being checked and the card catalogue and book records are being brought up to date, a matter that has long needed attention. Through other assistance supplied by the same agency, it has been possible for us thoroughly to clean the living collections of plants in the conservatories and at the same time to do much work on the grounds in reference to making them more tidy and more attractive.

SUMMARY

Accessions:

Plants received	7,991
Seeds (packets) received	2,688

The status of the conservatory collection of living plants is as follows:

Range No. 1	10,229
Range No. 2	10,354
Propagating House	6,389
Total	26,972

Displays:

	Plants	*Varieties*
Tulips	13,825	72
Narcissus	200,000	150
Iris		1,855
Peony	698	435
Rose	5,000	280
Dahlia	1,100	400
Chrysanthemums		268
Cannas	1,060	64
Lilac	560	85
Mallow	560	
Variegated plants	510	68
Dwarf plantation	66	28
Fall-flowering shrubs	85	11
Gladiolus	10,000	1,000
Rock gardens	5,000	

Flowering plants for display at Range No. 2:

Chrysanthemums	311
Begonias	144
Pelargoniums	150
Fuchsias	108
Gloxinias	60
Hydrangeas	53
Cyclamens	248

Show Labels	5,126
Aluminum Labels	1,200

IRIS AND NARCISSUS

Mrs. Ethel Anson S. Peckham, Honorary Curator of Iris and Narcissus Collections, reports that the Narcissus plantings presented an unusually fine appearance in the spring, and that throngs of people visited the Gardens to view the flowers and study the labels. No new plantings were made. All varieties have improved with the exception of King Alfred, which shows some deterioration.

The Iris collections have received more intensive care this year through the assignment of one gardener who was responsible for the maintenance of the collections. The general condition of the plants in the various collections has been greatly improved through the use of fungicides, through removing unhealthy plants, and through transplanting.

A list of varieties needed for the Alphabetical Garden was prepared and sent to various specialists and to the American Iris Society. A fair return was received from this effort and more plants are promised. A few were received by purchase. In the beardless collection, some changes have been made in planting and in a better arrangement of the beds.

New varieties have been added to the color planting from the trial garden and from material received as gifts. Blocks of one sort that were too large have been reduced and the collection as a whole has been made more representative. The names on the labels have been changed to conform to those in the American Iris Society check list.

In the Nursery, the Irises judged in 1929 and 1930 were dug and distributed, returned to the owners or destroyed in accordance with instructions received from those who submitted material. Many of the species described by Dr. Small were sent to botanists, botanical and test gardens, and to individuals. The seedlings from many crosses were checked and transplanted or destroyed. The collections made by Dr. Small, Mr. Alexander and Mr. Marple in Louisiana—a total of 6,233 plants—have been planted and are growing well. A large quantity of seeds were collected from plants growing in the Nursery and seeds from species described by Dr. Small were distributed to about sixty-five individuals and institutions, a total of 350 packets being sent out. An attempt has been made to naturalize several species and varieties by broadcasting seed along the banks of the Bronx River and near one of the Garden ponds.

There was considerable loss of seeds at the Nursery due to the ravages of bud moths, in consequence of which it is

proposed during the next season to bag all of the seedpods of Iris that are allowed to remain on the plants, whether they have resulted from special hand-pollination or not. In reference to the species native of Florida and Louisiana, it has been found in practice that the stalks with capsules must be staked and tied twice, once close under the pod, as the weight of the mature capsules is such that the stems bend to the ground, with the result that some of the capsules may be spoiled. This is a provision of nature to permit the seeds to be floated for dissemination during periods of flood.

The total distribution of Irises from the Garden was very large during the year and the quality of the material was considerably better than in previous years. Donors during 1930 were:

E. J. Alexander
Dr. W. McL. Ayres
L. Band
Dr. S. S. Berry
Mrs. M. Black
Glen Road Iris Garden
Mrs. C. Groth
Howard & Smith
G. H. Hudson
Indian Spring Farms Inc.
V. C. Johnson
Kenwood Iris Garden
J. D. Long Seed Co.
Longfield Iris Farm
J. B. Marple
R. Marshall
Mrs. C. F. McKinney
Meadow Mountain Bulb Farm
Dr. A. E. Waller
R. Wayman
Dr. E. T. Wherry
Bay State Nurseries
W. C. Blanchard
Mrs. W. C. Brinton
Brook Gardens
Miss Helen Ellender
F. C. Morgan
Mrs. B. S. Nelson
J. C. Nichols
Mrs. L. J. Paxton
Mrs. W. H. Peckham
Quality Gardens
C. E. Raynal
C. Salbach
Dr. J. K. Small
J. Soar
Southern California Iris Garden
C. Starker
Stumpp & Walter Co.
Weed Iris Gardens
C. B. Wing

PLANT PATHOLOGY

Dr. B. O. Dodge, Pathologist, reports that the task initiated last year to improve conditions in relation to various diseases in the Iris plantings, through soil fertilization and the application of fungicides, has been prosecuted to the

point wherein all beds in the alphabetical and variety plantings have been treated and replanted. The results have been highly gratifying.

The study of virus diseases of Dahlias has been largely taken over by Mr. Philip Brierley under a new coöperative arrangement with Cornell University, The Boyce-Thompson Institute for Plant Research, and the Office of Horticulture of the United States Department of Agriculture. Mr. Brierley personally inspected all of the plants in our living collections during the summer, making it possible for us to build up a better grade of stock through the roguing of suspected plants; many of the apparently diseased plants were segregated to be grown in our Nursery and at Yonkers for further study. Work will be continued at The New York Botanical Garden in the study of fungous and bacterial diseases of Dahlias as in the past.

A study of diseases of other ornamental plants, such as Buxus, Iris and Roses, has been continued and four short papers giving the results of these studies were published during the year. The opportunity that Dr. Dodge had of spending several weeks during the summer in Europe enabled him to study the Dutch Elm disease and various diseases of Roses, Dahlias and other cultivated ornamentals and the conditions prevailing in various botanical gardens.

The relationship between certain species of the fungus genus Sporotrichum, known to cause disease in man, and those species of this genus causing bud rot of Carnations, is being investigated in coöperation with the Laboratory of Medical Mycology, College of Physicians and Surgeons, Columbia University.

Our collections of cultures of fungi have recently been increased by a gift of more than two hundred species of Aspergillus, Penicillium, and related groups from Dr. Charles Thorn of the United States Department of Agriculture. Since our collections now contain many species pathogenic to plants and some pathogenic to man and other animals, and still others of economical importance, the Garden is now in a position to be of greater service to the

community through supplying material for study to physicians, industrial mycologists and others.

The results of work done on hybridization and inheritance in the genus Monilia were presented by invitation at the Fifth International Botanical Congress, Cambridge, England, in August, and also before Section G of the American Association for the Advancement of Science at the Cleveland meeting at the end of the year. These results will be published in "Mycologia."

The usual inspections of the living collections of plants in the Garden have been made with a view to detecting injury by fungi and by insects. Spraying has been resorted to where necessary. Sycamore blight was no more severe than in the past few years, partly defoliating a number of large trees. The Tulip tree scale, which has hitherto not been serious, appeared during the summer in abundance on several of the large Tulip trees. In preparing the ground for the new Dahlia plantings, a considerable number of larvae of the Asiatic beetles were found. This indicates that it may probably be necessary to treat the grounds where these larvae are abundant if the lawns are to be kept in good condition.

MUSEUMS AND HERBARIUM

Dr. John K. Small, Head Curator of the Museums and the Herbarium, reports that during the year a total of 75,401 specimens were added to the permanent and exchange collections of the Garden, as follows:

Through gift and purchase.....	39,668
Through exchange	21,671
Through exploration	14,062

This material came from nearly all parts of the world. About 8,900 duplicate specimens were sent to other institutions in exchange.

In the museums various specimens were interpolated in public exhibits of the fossil plant collections, the several departments of the Economic Museum and to several of the divisions of the Systematic Museum.

An 11-foot cross-section of the trunk of a Redwood tree, *Sequoia gigantea,* was received from the Sequoia National Park in California and has been temporarily installed in the basement of the Museum Building.

The most striking improvement has been the thorough cleaning of all exhibit cases, all containers and all exhibits on the three floors of the Museum Building. This has been made possible through the coöperation of the Emergency Work Bureau through which organization the necessary labor was secured.

In the herbarium the total number of herbarium specimens incorporated far outnumbered the total of any recent years. The great majority of specimens mounted came from the United States, Mexico, Central America, northern South America, Asia, Malaysia and Polynesia. The outstanding accession for the local collections was the Ferguson Herbarium, estimated to contain 10,000 sheets. The total number of specimens mounted and distributed was well in excess of 60,000 and includes not only recently received collections but also a large amount of valuable material long held in storage.

Dr. P. A. Rydberg, Curator, has continued to take charge of the herbarium of flowering plants. Much of his time was occupied in routine work. His monographic work on the North American Portulacaceae is nearly completed. During the last part of the year much of his time was also occupied in editing his forthcoming "Flora of the Prairies and Plains of Central North America," which is to be issued as an official publication of The New York Botanical Garden.

Dr. H. A. Gleason, Curator, devoted much of his time to work on the flora of South America. This work has progressed satisfactorily, thanks to the able assistance of Albert E. Smith, Assistant Curator, and the temporary assistance from Harold N. Moldenke, graduate student. The chief lines of activity have included: (1) Completion of the study of the Tate collection from Mount Duida, including the preparation of manuscript concerning it.

(2) The partial study and incorporation into the herbarium of certain groups of the Killip & Smith Peruvian collection. (3) Preparation of a large number of typed copies of original descriptions of South American species, to be placed in the herbarium with the specimens. (4) Continued study of the older collections in our herbarium resulting in the identification of numerous species hitherto unnamed. Part of this work was accomplished in the herbaria at Berlin, Geneva and Kew during the spring and summer.

Dr. Marshall A. Howe, Assistant Director, has, in addition to his administrative duties, continued his studies of marine algae, particularly those of Porto Rico, Brazil and Uruguay. He has also given considerable attention to certain lime-secreting fresh-water algae that are responsible for the deposition of calcareous travertine. His general curatorial work has been devoted to the herbarium collections of algae and hepaticae. As has been his custom for the past twelve years, Dr. Howe has had charge of the collection of Dahlias. This floral display included about 1,100 plants, representing nearly 400 of the newer and better varieties and it attracted much favorable attention.

Dr. Fred J. Seaver, Curator, continued in charge of the mycological collections. Mounting of accumulated material was greatly speeded up during the latter part of the year through additional assistants supplied by the Emergency Work Bureau. Six duplicate sets of rusts, collected during the summer of 1929 in Colorado, Wyoming and South Dakota by Dr. Seaver, were prepared and distributed in exchange. Research work was continued on the cup-fungi and substantial progress made in the compilation of the second volume of "North American Cup-fungi" and several preliminary papers were published.

Editorial work on "Mycologia" was continued as usual, the volume for 1930 consisting of 334 pages of text with 25 plates and 11 text figures. In order to increase the size of this publication, a notice of an increase in price from $4.00 per year to $5.00 per year was distributed with the

September-October issue. An effort is also being made to enlarge our subscription list, which is now approximately four hundred.

In the absence of the Honorary Curator of Mosses, Mrs. N. L. Britton, Mr. Williams reports that various collections were received from individuals and institutions in the United States for determination, and such material has been reported upon and incorporated in the Herbarium. Collections from outside of the United States have included in excess of three hundred specimens from Colombia and various collections from Peru, British Guiana, Haiti, the Philippine Islands, Hawaii, China, Russia, Greenland and Canada.

Mr. Percy Wilson, Associate Curator, continued his scientific work with Dr. N. L. Britton on the "Flora of Porto Rico and the Virgin Islands," bringing to completion volume 6, part 4, which was issued December 19. He also accomplished considerable work on the manuscript of the "Flora of Cuba" and on manuscript for "North American Flora."

Mrs. Palmyre de C. Mitchell, Associate Curator, devoted part of her time to the various tasks connected with general mechanical herbarium routine. Special work consisted of the sorting and arranging of several thousand specimens of the Bicknell herbarium and in preparing sets of duplicates for distribution. Work connected with loans of specimens to other institutions, selecting, listing, packing and returning to the cases, continued throughout the year. In December work was initiated on a very large scale in the cleaning and repairing of herbarium specimens, this being made possible by the detail of about twenty employees from the Emergency Work Bureau.

Dr. Small continued, in addition to his general curatorial details, to develop the collections, herbarium and plantations, especially on the plants of the Gulf States and contiguous territory, by means of personal field work and through correspondence. Exploration and collecting was carried on during three excursions to the Gulf States: in the spring for studying and securing Iris plants for the

plantations of the Garden and federated plantations; in the summer for Iris seeds for making four semi-scientific plantations of Iris seedlings in Florida, Maryland, New Jersey and at the Garden, and for a large number of miscellaneous minor plantations of Iris seedlings; in the fall for several special studies in the field and at Tulane University, New Orleans, La. The Florida plantation of Iris seedlings is already installed and the others will be early in 1931. Much of the field work was made possible by the coöperation of Colonel and Mrs. Raymond Robins, Mrs. Arthur Curtiss James, Mrs. Wheeler H. Peckham, Mr. Clarence Lewis and Mr. Henry Lockhart, Jr. Surplus Iris material, left over from studies already made, was distributed at home and abroad by Mrs. Peckham, Honorary Curator of the Iris and Narcissus collections. Living plants installed in preceding years, as well as some collected this year, were drawn upon for making illustrations for "Addisonia" by Miss Eaton and Miss Mansfield. These represent a beginning of a complete colored representation of the Irises of the Gulf States, a highly important angle of our Iris studies.

Mr. Edward J. Alexander coöperated in most of the above activities at the Garden and participated in the field work in the spring, and edited "Addisonia." The plan to build up living palm collections resulted in the assembling of seeds of many kinds of palms from tropical America and tropical Asia for growing at the Garden and in Mrs. Arthur Curtiss James' reservation at Miami, Florida. Continued aid was extended to Mr. Edison, both at the Garden and at Fort Myers, Florida, in his investigations of rubber in our native plants.

LOCAL HERBARIUM

Dr. Herbert M. Denslow, Honorary Custodian of the Local Herbarium, reports that during the year he has had little opportunity to work on the local collections. A considerable part of the Bicknell collection has been sorted and the labels written, and critical work has been done

upon the representatives of several families. Work has been initiated on selecting a set for mounting and the preparation of the duplicate sets of the Bicknell Herbarium for distribution. At the close of the year there were 26,140 specimens in the Local Herbarium and unmounted accessions from various sources received during the year amounted to 258.

During the year, the important Long Island collection of William Cashman Ferguson was received, in accordance with the terms of his will. It is estimated that this collection contains approximately 10,000 sheets. At the end of the year, about one-half of the collection has been mounted. As soon as this task is completed it will be distributed into the Local Herbarium.

ECONOMIC COLLECTIONS

Dr. H. H. Rusby, Honorary Curator of the Economic Collections, reports that the work of renovating the Economic Exhibits which was inaugurated in November is nearly complete and that the results have been eminently satisfactory. All cases have been cleaned inside and out and all glass containers have been emptied and given similar treatment. It is satisfactory to note that these museum specimens, preserved as they have been in air-tight containers for more than twenty-five years, have been perfectly preserved and that the recently cleaned specimens are now just as presentable as when they were originally installed.

In connection with this renovation of the public exhibits, all labels have been carefully checked. A considerable number of new labels have been prepared.

One of the important results accomplished in this review of the collections has been the formation of a list of desiderata that are required to fill omissions and complete series, and a special effort will be made to perform this work during the coming year.

As an experiment, an attempt was made during the year to prepare popular monographs of certain products for publication in the "Journal," providing reprints to be sold

at nominal cost to those interested. The result has been sufficiently encouraging to justify a continuation of the procedure. It is, however, desirable that a special attempt be made to bring these small popular monographs to the attention of those interested.

It is recommended that the second and fourth groups of cases on the north side of the west wing be completed by the addition of two cases, for which space has been left in this group. This will obviate the present overcrowding of the material in the exhibit cases and provide space for the installation of additional material.

PALEOBOTANY

Dr. Arthur Hollick reports that the principal research prosecuted by him during the year was in connection with the study of Pleistocene plant remains from the upper Connecticut River Valley; on fossil cycads and fan palms from the Tertiary of Alaska, and on Triassic plants from Staten Island, New York. A number of collections of individual specimens of fossil plants sent or brought to the Museum were identified.

The paleobotanical collections in the display cases have been thoroughly cleaned and, as necessary, new display labels have been prepared. The improved appearance of the public exhibits is noteworthy.

A total of eighty-two specimens of fossil plants were accessioned and added to the Museum collection. Continued effort has been maintained, through correspondence and exchange, to secure reprints of current paleobotanical literature.

LABORATORIES

Dr. A. B. Stout, Director of Laboratories, reported that general items have been continued as in the past few years.

Lily disease investigation has been continued, although Dr. Carl F. Guterman, who has held the scholarship for this research, has accepted an appointment as Assistant Professor in Pathology in Cornell University. A report of

the results of the research to date will be published by The Horticultural Society of New York. In England he observed that various diseases are as common and as destructive there as with us, and this condition was brought to the attention of several of the principal specialists on lilies there.

Mr. Yukio Fujimaki, of the Department of Agriculture, Japan, delegated to study the diseases of lilies, has consulted with us regarding our results and Mr. Suzuki of the Yokohama Nursery has been in contact with the work throughout the year. The Yokohama Nursery Company donated to the Garden three cases of lily bulbs for use in experimental work and in display plantings.

Coöperation with the American Iris Society has this year consisted largely in further studies of the longevity of Iris pollen and of the character of the seedlings of previous breeding. Some breeding was done with the most promising seedlings.

The laboratory studies of the diseases of the poplars have been transferred to the Research Laboratories of The Oxford Paper Company at Rumford, Maine, where there is a close connection with nursery and field plantings. Mr. Schreiner has completed the requirement for the degree of Ph. D. after several years of study as a registered student of the Garden. Dr. Stout is continuing as consultant in the entire project and especially in the study and selection of the hybrids already obtained.

Research continues to be directed mainly to studies of sterility and fertility in plants and to plant breeding. Special attention was given during the year to cytological studies of the processes of fertilization in plants which possess incompatibilities. Additional facilities for growing seedlings in greater number at the Garden, and on certain estates, have greatly promoted the selective breeding of various Hemerocallis. Mr. Clarence Lewis has continued his assistance to this project and in June 2,500 young seedlings were planted at his estate (Skylands) where they will be reared.

Coöperation with the New York State Agricultural Experiment Station was this year confined to breeding work with grapes, with the object of producing new hardy seedless grapes. Several other plants are being utilized in various studies of sterility, of which mention may be made of Pelargonium, Petunia, Convallaria and a seedless cucumber.

Through a gift from Mr. Charles Totty, plants of several types of the hardier garden Chrysanthemums were obtained last spring. These have been studied as to their fertility and over 1,000 seeds obtained from various crosses.

Breeding with Moss Roses was begun in 1929 at the estate of Mr. Clarence Lewis with the aim of developing new and hardier types, especially with yellow flowers. Mr. Lewis is adding more varieties to his collection and it is the plan to continue and to extend this breeding effort.

Additional laboratory space and additional equipment is most urgently needed and it is hoped that proper provision can be made to relieve our present situation. Some of the older badly worn equipment should be replaced with modern apparatus. Scholarships to support work in plant breeding and in the study of sterilities are highly desirable.

List of Candidates for Degrees, Special Investigators, and Scholars Registered During the Year

Bonisteel, William John	—Research in Plant Breeding
Breunich, Katherine Adele	—Scholarship in Studies of Sterility
Chandler, Florence Clyde	—Research
Core, Earl L.	—Taxonomy, Flowering Plants
Fried, Dorothy	—Mycology
Fulling, Edmund Henry	—Taxonomy and Physiology
Hershkowitz, I. A.	—Flower Behavior in *Acer*
Hopp, Henry	—Scholarship in Pathology
Keur, John Yak	—Research with Abutilon
Koch, Dr. Minnia Frotscher	—Morphology and Taxonomy
Lindegren, Carl C.	—Genetics of Fungi
Martin, Prof. George Willard	—Scholarship in Mycology
Moldenke, Harold Norman	—Taxonomy, Flowering Plants
P'ei, Chien	—Taxonomy, Flowering Plants
Schreiner, Ernest J.	—Research with *Populus*
Smith, Albert Charles	—Taxonomy, Flowering Plants

Swift, Marjorie Elizabeth	—Cytology
Thayer, Gardis Bigelow	—Scholarship in Plant Breeding
Wittrock, Gustave Ludwig	—Taxonomy, Flowering Plants.

In addition to those named above, Lydia B. Walsh, L. Gordon Utter and Mary J. Cobb have taken the course in mycology given by Dr. Dodge.

LIBRARY

Miss Sarah H. Harlow, Librarian, reports that the year 1930 has been one of continued growth in the library, the largest proportion of accessions being publications on horticulture. A total of 1,743 bound volumes has been added to the library: 606 by purchase, 61 by gift, 23 by exchange or deposit and 1,053 by binding, the latter number including 19 volumes belonging to Columbia University. The number of bound volumes on the shelves at the close of the year was 41,025 as compared with 39,282 at the close of the preceding year. During the year 83 volumes were rebound. The principal accessions with names of donors have been listed, as in the past, in current numbers of the Journal.

Through additional assistance made available toward the end of the year, all of the duplicate material from the Geneva and Barnhart collections has been indexed and alphabetically arranged, thus freeing additional shelving space for the library proper and placing this material in condition for disposal by sale and by exchange.

The catalogue of new species cards has been increased by the addition of 4,804 numbers, while the general catalogue has been enriched by 2,572 new typewritten cards and 2,538 from the data printed in the Bulletin of the Torrey Botanical Club.

BIBLIOGRAPHY

Dr. John H. Barnhart, Bibliographer, reports that routine work in connection with the library in rendering assistance to individuals using the library and in selecting new books and supervising their purchase, has required more time than in the past, although bibliographic research has not been neglected. Parts 4 and 5 of Volume 23 of the

"North American Flora" were issued during the year, and Part 13 of Volume 7 will be issued in the near future.

Dr. Barnhart was one of the delegates of the Garden to the Fifth International Botanical Congress, where he gave special attention to the sub-section on nomenclature. He was appointed one of the seven members of the Executive Committee of the New International Commission on Nomenclature, to function in the interim between 1930 and the time of the next International Botanical Congress in 1935. In connection with his trip to Europe he took advantage of the opportunity of continuing his taxonomic studies upon the Lentibulariaceae at the British Museum and at the Royal Botanic Gardens, Kew.

PUBLIC EDUCATION

Dr. Foreman T. McLean, in charge of public education, reports that in response to a request by the organization of school teachers of the Bronx, and with the coöperation of staff members, three new courses of study were announced for teachers and others of similar interest: (a) a course in Plant Ecology, (b) a course in Practical Gardening, and (c) a course in the Elementary Principles of Systematic Botany. Each of these courses carries thirty credit hours.

The first course had an enrolment of 27, and the second had an enrolment of 23; the third course is scheduled for the first part of the coming year. Judging by expressions of opinion received, these courses are meeting a real need and are greatly appreciated by those taking advantage of them.

A series of fifteen evening lectures on gardening were also conducted last spring at New Rochelle in coöperation with the Extension Division of New York University; the work was well received.

The illustrated public lectures on botanical and horticultural subjects were continued in the Museum Building on Saturday afternoons. The total attendance at the series of forty lectures was 5,229, an average of 131, the highest average attendance for any series of lectures of which we

have a record. The winter lectures and demonstrations at the Central Display Greenhouse have been resumed this season, the attendance at the first two there being 85 and 94 respectively.

The request for guidance of parties and organizations about the grounds was about equal to that of previous years, the total being 4,426 students. The Roosevelt and Evander Childs High Schools each made two trips of their classes to the Garden and the last of these, by the Roosevelt High School, numbered about 800 pupils. The total attendance at these four high school excursions was approximately 2,500.

Docentry work for students from the public schools, classes from Teachers College, Hunter College, the New York Training School for Teachers, and by garden clubs from New Jersey and New York and other organizations was continued.

The municipal radio station WNYC and a few other stations requested radio talks by members of the Garden staff. A series of five such talks were given monthly over WNYC during the summer.

The weekly notices and news items to the newspapers in New York and in the suburbs have been continued throughout the year. One hundred twenty-nine items have been sent out during the year, consisting of one hundred seventy-six typewritten pages, and these have been used not only by many newspapers, but also by such magazines as "Horticulture" and the "Literary Digest."

An extensive display planting of Gladiolus was maintained at the location of the old Dahlia Border, northeast of the railway station. This consisted of more than one thousand varieties and totaled about ten thousand bulbs in the planting. The Metropolitan Gladiolus Society held its show this year at the Garden on Saturday and Sunday, August 23 and 24. The exhibit was arranged in the east end of the main floor and attracted much better attendance and better exhibits than the previous year. The combination of the display beds and the show located within five minutes' walk

of each other proved particularly acceptable to visitors from a distance.

Forty lectures, in which slides belonging to The New York Botanical Garden were used, were given by members of the staff before garden clubs and other outside organizations. The Garden was also called upon to furnish judges in connection with a number of horticultural and flower shows, including the International Flower Show in March, and the Atlantic City Flower and Garden Pageant, and was asked to take part in the judging of a number of outdoor garden contests.

The greater part of the photography during the year was done in connection with the scientific and research work of the Garden. During the year 554 photographs, 266 colored and 111 uncolored lantern slides were made.

Studies of inheritance in the genus Gladiolus, cross-breeding experiments and studies of pollen viability in species and hybrids were continued in coöperation with Dr. Stout. For the American Chemical Society work on a monograph on manganese, iron, and aluminum in relation to soil acidity and plant growth has been undertaken.

SCIENTIFIC DIRECTORS

Dr. R. A. Harper, Chairman of the Scientific Directors, reports that the regular meetings of this body have been held and that many questions of policy in connection with the further development of the Garden's scientific and educational work have been considered. In extending the scope of its interest under the new Director, Dr. Merrill, to the plant life of Asia and the Far East, the Garden is confronted with problems of the utmost importance. It is thus entering a territory which has already furnished a vast amount of plant material of the highest horticultural and biological interest and still remains one of the least known regions of the earth from the standpoints of plant geography and floristic evolution. It is highly appropriate that The New York Botanical Garden should take the lead in this work, now that socially and commercially our inter-

ests are turning so notably in that direction. The data as to the progress of work on the "North American Flora," the rapid growth of the plant collections, the new results in plant breeding and the protection of the plantations from insect and fungous pests are given in the report of the Director.

PUBLICATIONS OF STAFF MEMBERS

The following list covers the technical and semi-technical papers actually published by staff members during the year 1930. Hitherto these data have appeared in the Journal of The New York Botanical Garden but it is believed that they form a legitimate part of the annual report as indicating to a certain degree the activities of staff members in the scientific field.

Alexander, E. J. Viola Priceana. Addisonia **14:** 55, 56. *pl. 476;* Gelsemium sempervirens. 57, 58. *pl. 477.* [1929] F. 1930.

Boynton, K. R. Pyconostachys Dawei. Addisonia **14:** 51, 52. *pl. 474;* Lobelia sessilifolia. 59, 60. *pl. 478;* Kleinia articulata. 61, 62. *pl. 479.* [1929] F. 1930.

Britton, N. L. The planting of Stahlia on Arbor Day in Porto Rico. Jour. N. Y. Bot. Gard. **31:** 45-47. F. 1930.

———The native Cactaceae of Porto Rico and the Virgin Islands. Jour. Cact. Soc. Am. **1:** 226-231. My. 1930.

———Scientific Survey of Porto Rico and the Virgin Islands. Jour. N. Y. Bot. Gard. **31:** 161-167. Jl. 1930.

———Sabina florida. Addisonia **15:** 33, 34. *pl. 397;* Corynella pauciflora. 35, 36. *pl. 498;* Jaquemontia subsalina. 37. *pl. 499;* Proustia Krugiana. 39. *pl. 500;* Cestrum laurifolium. 41. *pl. 501;* Acnistus arborescens. 43. *pl. 502;* Anoda acerifolia. 45. *pl. 503;* Mentzelia aspera. 47. *pl. 504.* O. 1930.

———Notes on Consoles corallicola Small. Jour. Cact. Soc. Am. **2:** 347-349. N. 1930.

———Krameriaceae. N. Am. Fl. **23:** 195-200. N. 1930.

———with **Rose, J. N.** Caesalpiniaceae. N. Am. Fl. **23:** 201-268. N. 1930.

——— ———Caesalpiniaceae [Conclusion]. N. Am. Fl. **23:** 269-349. D. 1930.

———with **Wilson, P.** Botany of Porto Rico and the Virgin Islands. [Supplement to descriptive flora]. N. Y. Acad. Sci. Survey **6** [Part IV]: 523-663. D. 1930.

Dodge, B. O.—Breeding albinistic strains of the Monilia bread-mold. Mycologia **22:** 9-38. *f. 1.* and *pl. 8, 9.* Ja.-F. 1930.

———Material for demonstrating sexuality in the Ascomycetes. Torreya **30:** 35-39. Mr.-Ap. 1930.

———Development of the asexual fructifications of Chaetomella raphigera and Pezizella lythri. Mycologia **22:** 169-174. *pl. 20, 21.* Jl.-Au. 1930.

———with **Swift, Marjorie E.** Further notes on Iris troubles. Jour. N. Y. Bot. Gard. **31:** 25-34. *f. 1-3.* F. 1930.

——— ———Notes on boxwood troubles. Jour. N. Y. Bot. Gard. **31:** 191-198. *f. 1, 2.* Au. 1930.

Gleason, H. A. Deam's grasses of Indiana. Torreya **29:** 164. [1929] 1930. [Review].

———Studies on the flora of northern South America. XIV. Melastomataceae from Colombia and Ecuador. Bull. Torrey Club **57:** 63-75. F. 1930.

———Backyard botanizing. Torreya **30:** 1-6. Mr. 1930.

———Vanilla planifolia. Addisonia **14:** 49, 50. *pl. 473.* [1929]. F. 1930.

———Morris & Eames' Our wild orchids. Jour. N. Y. Bot. Gard. **31:** 77-78. Mr. 1930.

———A plea for sanity in nomenclature. Science, NS. **71:** 458, 459. My. 1930.

———Niedenzu's Malpighiaceae. Torreya **30:** 101-103. Jl.-Au. 1930. [Review].

———Report on botanical study in Europe, 1930. Jour. N. Y. Bot. Gard. **31:** 264-266. N. 1930.

———with **Bonisteel, W. J.** Aconitum noveboracense. Torreya **29:** 152-153. [1929] 1930.

———with **Smith, A. C.** Methods of preserving and arranging herbarium specimens. Jour. N. Y. Bot. Gard. **31:** 112-125. *f. 1-3.* My. 1930.

Hollick, A. The petrified forests of Arizona. Jour. N. Y. Bot. Gard. **31:** 14-18. Ja. 1930.

———Some examples of interrelations of rocks and trees. Jour. N. Y. Bot. Gard. **31:** 141-148. *f. 3-7.* Je. 1930.

———Plant life south of the ice front during the glacial epoch. Jour. N. Y. Bot. Gard. **31:** 176-177. Jl. 1930.

———The Upper Cretaceous flora of Alaska. U. S. Geol. Survey, Prof. Paper **159:** 1-123. *pl. 1-87. f. 1-5.* Washington, D. C. 1930.

———One thousand miles down the Yukon by canoe. Jour. N. Y. Bot. Gard. **31:** 292-296. D. 1930.

———with **McLean, F. T.** Australia, past and present. Jour. N. Y. Bot. Gard. **31:** 217-225. S. 1930.

Howe, M. A. The resignation of Doctor Nathaniel Lord Britton as Director-in-Chief of The New York Botanical Garden. Jour. N. Y. Bot. Gard. **31:** 1-6. *pl. 305.* Ja. 1930.

———Doctor Elmer Drew Merrill, the new Director-in-Chief. Jour. N. Y. Bot. Gard. **31:** 6-10. Ja. 1930. [Illust.].

———Dahlia Maxoni. Addisonia **14:** 63, 64. *pl. 480.* [1929] F. 1930.

———The alphabetical iris check list. Jour. N. Y. Bot. Gard. **31:** 100, 101. Ap. 1930. [Review].

———Dahlias are plants of American origin. Arts and Decoration **33:** 64, 65, 96, 98. S. 1930. [Illust.].

———Dahlias. Radio Home-makers **3** (4) : O. 1930.

McLean, F. T. Gladiolus exhibition at The New York Botanical Garden. Jour. N. Y. Bot. Gard. **31:** 213-217. S. 1930.

Merrill, E. D. Tobacco in New Guinea. Amer. Anthropol. **32:** 101-105. Ja. 1930.

———Report of the Agricultural Experiment Station of the University of California from July 1, 1928 to June 30, 1929. 1-123. *pl.* 1. F. 1930.

———A supplementary list of Hainan plants. Lingnan Sci. Jour. **6:** 271-289. Mr. 1930.

———On Miquel's Kwangtung species based on Krone's collection. Sunyatsenia **1:** 1-48. *pl. 1-20.* Je. 1930.

———with **Chun, W. Y.** Contributions to our knowledge of the Kwangtung flora. Sunyatsenia **1:** 49-84. Je. 1930.

———A second supplementary list of Hainan plants. Lingnan Sci. Jour. **6:** 323-332. Je. 1930.

———Botanical exploration of Borneo. Jour. N. Y. Bot. Gard. **31:** 185-191. Au. 1930.

———Le genre Tolbonia O. Kuntze synonyme de Calotis. Bull. Soc. Bot. France **77:** 340-341. S. 1930.

———The improbability of pre-Columbian Eurasian-American contacts in the light of the origin and distribution of cultivated plants. Jour. N. Y. Bot. Gard. **31:** 209-212. S. 1930.

———A third supplementary list of Hainan plants. Lingnan Sci. Jour. **9:** 35-44. O. 1930.

———The fifth International Botanical Congress. Sci. Monthly **31:** 565-568. *f. 1.* N. 1930.

———An international botanical address-book. Science, NS. **72:** 652. D. 1930.

Rusby, H. H. Cotton. Jour. N. Y. Bot. Gard. **31:** 105-111. *f. 1, 2.* My. 1930.

———Coffee. Jour. N. Y. Bot. Gard. **31:** 163-175. *f. 1-3.* Jl. 1930.

———Progress in our knowledge of ergot. N. Y. Pharmacist **4:** 18. O. 1930.

Rydberg, P. A. Notes on Fabaceae. XII. Bull. Torrey Club **56:** 539-554. F. 1930.

———Genera of North American Fabaceae. VII. Am. Jour. Bot. **17:** 231-238. *pl. 16, 17.* Mr. 1930.

———Bicuculla eximia. Addisonia **14:** 53, 54. *pl. 475.* [1929] F. 1930.

Seaver, F. J. A mycological foray through the mountains of Colorado, Wyoming and South Dakota. Mycologia **22:** 1-8. *pl. 1-7.* Ja. 1930.

———Photographs and descriptions of cup fungi. X. Ascotremella. Mycologia **22:** 51-54. *pl. 11, 12.* Mr. 1930; XI. Solenopezia. 122-124. *pl. 16.* My. 1930; XII. Elvelaceae. 163, 164. *pl. 17-19.* Jl. 1930; XIII. Subhypogenous forms. 215-218. *pl. 22, 23.* Au. 1930.

———Pezizales (in Mycological Explorations of Colombia): Jour. Dept. Agri. Porto Rico **14:** 225-227. O. 1930.

Small, J. K. The Okeechobee gourd. Jour. N. Y. Bot. Gard. **31:** 10-14. Ja. 1930.

———Chronicle of eastern American Iris. Jour. N. Y. Bot. Gard. **31:** 40-45. F. 1930.

———Chronicle of the palms of the continental United States. Jour. N. Y. Bot. Gard. **31:** 57-66. F. 1930.

———Deeringothamnus Rugelli. Addisonia **15:** 17, 18. *pl. 489;* Malvaviscus Drummondii. 19, 20. *pl. 490;* Befaria racemosa. 21, 22. *pl. 491;* Physalis Elliotii. 23, 24. *pl. 492;* Consolea corallicola. 25, 26. *pl. 493;* Swietenia Mahagoni. 27, 28. *pl. 494;* Justicia Runyonii. 29, 30. *pl. 495;* Citharexylum fruticosum. 31, 32. *pl. 496.* S. 1930.

———Iris studies in the Gulf States. Jour. N. Y. Bot. Gard. **31:** 237-244. O. 1930.

———Harvesting Iris seeds in the Gulf States. Jour. N. Y. Bot. Gard. **31:** 272-277. *f. 1.* N. 1930.

Smith, A. C. A collecting trip across Peru. Jour. N. Y. Bot. Gard. **31:** 81-95. *f. 1-8.* Ap. 1930.

———Notes on Pteridophyta from Mt. Roraima. Bull. Torrey Club. **57:** 177-180. *pl. 8.* Ap. 1930.

———Mountain tops and low lands of Colombia. Econ. Geog. **6:** 398-407. *f. 1-9.* O. 1930.

———with **Gleason, H. A.** Methods of preserving and arranging herbarium specimens. Jour. N. Y. Bot. Gard. **81:** 112-125. *f. 1-3.* My. 1930.

———with **Killip, E. P.** The identity of the South American fish poisons "Cuba" and "Timbo". Jour. Wash. Acad. Sci. **20:** 74-81. *f. 1-4.* Mr. 1930.

———A botanical trip to eastern Peru and Amazonian Brazil. Bull. Pan-Am. Union **64:** 997-1009. [Illust.]. O. 1930.

Stout, A. B. The pollination problem in nut-bearing trees. Ann. Rep. Northern Nut-growers Assoc. for 1929. 1-7. 1930.

———Daylilies for your garden. Ladies' Home Journal **47:** 20, 21 and 156. [Illust. in color]. F. 1930.

———Hermerocallis Forrestii. Addisonia **15:** 1, 2. *pl. 481;* H. citrina. 3, 4. *pl. 482;* H. fulva longituba. 5, 6. *pl. 483;* H. fulva rosea. 7, 8. *pl. 484;* H. clon luteola. 9, 10. *pl. 485;* H. clon gold dust. 11, 12. *pl. 486;* H. clon mikado. 13. *pl. 487;* H. clon wau-bun. 15. *pl. 488.* Mr. 1930.

———Botanical observations in Europe. Jour. N. Y. Bot. Gard. **31:** 261-264. N. 1930.

———with **Fay, Dolores J.,** and **Chandler, Clyde.** The Iris scholarship for 1929. Bull. Am. Iris Soc. **33:** 3-8. Ja. 1930.

———with **Wellington, R., Einset, O.,** and **Van Alstyne, L. M.** Pollination of fruit trees. Bull. N. Y. State Exp. Sta. **677:** 1-54. *f. 1-7.* [1929]. Ja. 1930.

Swift, Marjorie E. A new species of Chaetomella on rose. Mycologia **22:** 165-168. *f. 1.* Jl.-Au. 1930.

———with **Dodge, B. O.** Further notes on Iris troubles. Jour. N. Y. Bot. Gard. **31:** 25-34. *f. 1-3.* Fe. 1930.

——— ———Notes on boxwood troubles. Jour. N. Y. Bot. Gard. **31:** 191-198. *f. 1, 2.* Au. 1930.

Williams, R. S. Haitian mosses collected by E. C. Leonard. Jour. Wash. Acad. Sci. **20:** 173-180. *f. A. 1-10. f. B. 1-8.* My. 1930.

———Notes on some Pleistocene mosses recently discovered. Jour. N. Y. Bot. Gard. **31:** 154. Je. 1930.

———Pseudoleskea arizonae sp. nov. Bryologist **33:** 20. *pl. 3.* O. 1930.

———Mosses collected in Brazil and Argentina by J. N. Rose in 1915. Jour. Wash. Acad. Sci. **20:** 465-475. *f. 1-13.* N. 1930.

Wilson, P. Notes on Flacourtiaceae. Torreya **30:** 72. My.-Je. 1930.

———with **Britton, N. L.** Botany of Porto Rico and the Virgin Islands. [Supplement to descriptive flora]. N. Y. Acad. Sci. Survey **6** (Part IV) : 523-663. D. 1930.

E. D. MERRILL,

Director-in-Chief.

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1930

EXHIBIT I

BALANCE SHEET

December 31, 1930

JOHN L. MERRILL, Treasurer

ASSETS

Permanent Fund Assets:			
Investments (Exhibit III)	$2,358,831.66		
Cash awaiting investment	28,312.05		
		$2,387,143.71	
Balance of permanent fund assets expended for current uses (see current fund liability per contra)		41,129.97	
			$2,428,273.68
Current and Working Assets:			
Cash in banks and on hand:			
For account of life beneficiary.. $	160.53		
Special purposes	16,242.21		
		$ 16,402.74	
Account receivable — City maintenance	20,613.52		
Interest and dividends receivable (Exhibit III)	29,917.07		
Prepaid insurance premiums, etc...	4,556.88		
		71,490.21	
			$2,499,763.89

EXHIBIT I

BALANCE SHEET

December 31, 1930

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 196,463.47	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,210.651.39	
Special endowment, with life interest in respect of income therefrom..		21,158.82	
			$2,428,273.68
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable	$ 4,766.73		
Income due to life beneficiary	160.53		
		$ 4,927.26	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 5,508.91		
Unexpended contributions set aside by the Board of Managers for specific purposes....	10,733.30		
		16,242.21	
Deferred income credits:			
Membership dues paid in advance	$ 600.00		
Subscriptions and fees paid in advance	1,633.30		
		2,233.30	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses.....		41,129.97	
Surplus:			
Surplus at December 31, 1929....$	28,186.49		
Less—			
Adjustment for the year 1929 in respect of income ..$4,110.97			
Excess of expenditures over income for the year ending December 31, 1930 (Exhibit II) 17,118.05			
	21,229.02		
		6,957.47	
		71,490.21	
		$2,499,763.89	

CERTIFICATE OF AUDITORS

We have made an examination of the books and accounts of The New York Botanical Garden for the year ending December 31, 1930, and we certify that, in our opinion, the attached balance sheet (Exhibit I) and relative statements (Exhibits II-V, inclusive) are properly prepared therefrom and set forth the financial position of the corporation as at December 31, 1930, and a summary of the transactions for the year ending on that date.

PRICE, WATERHOUSE & Co.

56 Pine Street, New York, April 16, 1931.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1930

	City maintenance	General	Restricted and special funds	Total
Income:				
Income from investments of permanent funds		$116,550.76	$ 9,874.32	$126,425.08
Contributions	$270,374.00	6,787.75	9,956.48	287,118.23
Membership dues:				
Annual		17,090.00		17,090.00
Sustaining		475.00		475.00
Sale of duplicate books and sundries		421.86		421.86
Subscriptions and sales of publications		2,967.15	2,806.80	5,773.95
Total income	$270,374.00	$144,292.52	$ 22,637.60	$437,304.12
Expenses:				
Maintenance and general expenses:				
Salaries of director-in-chief, assistants and garden staff	$188,644.26	$ 97,907.64	$ 8,486.10	$295,038.00
Wages	38,492.75	26,372.70		64,865.45
Materials and supplies	43,236.99	5,407.31		48,644.30
Stationery, printing, postage, etc.		4,097.06		4,097.06
Interest and exchange		339.20		339.20
Insurance		1,987.45		1,987.45
Traveling		3,369.13		3,369.13
Miscellaneous		2,724.45		2,724.45
	$270,374.00	$142,204.94	$ 8,486.10	$421,065.04
Improvements and exhibits:				
Improvements to buildings and grounds		$ 745.88		$ 745.88
Museum equipment purchased		2,492.67		2,492.67
Library equipment purchased		22.00		22.00
Laboratory equipment purchased		628.30		628.30
Maintenance equipment purchased		1,163.76		1,163.76
Library books, binding, etc.		1,577.88	$ 3,126.16	4,704.04
Museum specimens		4,694.23	579.54	5,273.77
Plant purchases and expenses		70.00	1,957.04	2,027.04
Botanical exploration and collections		711.11	50.00	761.11
Prizes for model gardens			189.77	189.77
		$ 12,105.83	$ 5,902.51	$ 18,008.34
Education and research:				
Public lectures and instruction			$ 4,184.62	$ 4,184.62
Scholarships, prizes, etc.			300.00	300.00
Publications		$ 7,099.80	5,422.71	12,522.51
		$ 7,099.80	$ 9,907.33	$ 17,007.13
Total expenses	$270,374.00	$161,410.57	$ 24,295.94	$456,080.51
Excess of expenses over income for the year		$ 17,118.05	$ 1,658.34	$ 18,776.39

EXHIBIT III

Summary of Investments, December 31, 1930

	Par value (no par value stocks at book value)	Approximate market value	Book value	Accrued interest and dividends December 31, 1930	Average yield for year on basis of	
					Market value	Book value
					%	%
General funds:						
Bonds	$ 544,800.00	$ 539,216.25	$ 530,618.13	$ 7,250.50	4.86	4.94
Stocks:						
Preferred ...	65,830.00	78,719.37	71,337.50	887.50	5.21	5.75
Common	20,268.80	10,028.38	20,268.80	255.50	10.19	5.04
	$ 630,898.80	$ 627,964.00	$ 622,224.43	$ 8,393.50	4.99	5.04
Sage fund:						
Bonds	$ 510,000.00	$ 503,513.25	$ 456,513.73	$ 9,116.24	4.88	5.39
Stocks:						
Preferred ...	155,611.25	189,676.87	164,898.76	831.25	4.95	5.70
Common	73,300.00	210,407.00	101,298.62	1,801.50	4.22	8.77
	$ 738,911.25	$ 903,597.12	$ 722,711.11	$ 11,748.99	5.74	5.93
Special endowment fund:						
Bonds	$ 19,000.00	$ 20,140.00	$ 19,398.50	$ 395.83	4.72	4.90
Stocks:						
Preferred ..	360,000.00	475,962.50	434,831.88	4,012.50	4.95	5.42
Common ...	21,400.00	36,740.00	43,709.03	360.00	4.61	3.88
	$ 400,400.00	$ 532,842.50	$ 497,939.41	$ 4,768.33	4.92	5.27
John D. Rockefeller, Jr. fund:						
Bonds	$ 201,000.00	$ 198,053.75	$ 200,760.25	$ 2,312.50	5.07	5.01
Preferred stocks	254,137.50	347,409.37	298,825.01	2,693.75	4.66	5.42
	$ 455,137.50	$ 545,463.12	$ 499,585.26	$ 5,006.25	4.81	5.25
Special trust fund:						
Common stock	$ 16,815.64	$ 13,894.50	$ 16,371.45		10.19	8.65
	$2,242,163.19	$2,623,761.24	$2,358,831.66	$ 29,917.07	4.88	5.43

Investments: Summary of Average Yields for Year

	On basis of Market value	On basis of Book value
Bonds ...:.....	4.90%	5.12%
Stocks:		
Preferred	4.88%	5.49%
Common	4.80%	7.17%
	4.88%	5.43%

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1930

	Balance January 1, 1930	Additions	Transfers	Balance December 31, 1930
Restricted endowments:				
Endowment for science and education	$ 89,115.49			$ 89,115.49
Addison Brown Fund	21,149.31			21,149.31
John Innes Kane Fund	35,347.63			35,347.63
Maria DeWitt Jesup Fund	25,000.00			25,000.00
Olivia E. and Caroline Phelps Stokes Fund	3,000.00			3,000.00
Charles Budd Robinson Fund	755.04			755.04
The H. H. Memorial Fund	5,000.00			5,000.00
Alexander P. Anderson and Lydia Anderson Fund	10,000.00			10,000.00
Students' Research Fund	6,386.00	$ 710.00		7,096.00
	$ 195,753.47	$ 710.00		$ 196,463.47
Unrestricted endowments:				
Endowment Fund	$ 230,543.06	$ 1,583.35		$ 232,126.41
David Lydig Fund	34,337.86			34,337.86
William R. Sands Fund	10,000.00			10,000.00
Darius Ogden Mills Fund	48,099.17			48,099.17
Henry Iden Fund	10,000.00			10,000.00
Fanny Bridgham Fund	30,000.00			30,000.00
Francis Lynde Stetson Fund	25,000.00			25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	775,178.78	9,179.80		784,358.58
Frances Griscom Parsons Fund	2,304.67			2,304.67
Special Endowment Fund	463,872.33	166.03	$35,000.00	499,038.36
The John D. Rockefeller, Jr., Fund	500,000.00			500,000.00
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34			19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00			12,750.00
The George N. Best Fund	3,000.00			3,000.00
Mary A. Dill Bequest	10,000.00		10,000.00*	
James B. Ford Bequest	25,000.00		25,000.00*	
	$2,199,722.21	$10,929.18		$2,210,651.39
Special Endowments:				
Special Trust Fund	$ 18,825.89	$ 2,332.93		$ 21,158.82
	$2,414,301.57	$13,972.11		$2,428,273.68

* Transfer to Special Endowment Fund.

EXHIBIT V

Special Funds

Statements of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1930	Additions	Expenditures	Balance December 31, 1930
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"		$ 4,479.30	$ 2,853.16	$ 1,626.14
Addison Brown Fund:				
Publication of "Addisonia"		3,869.55	3,869.55	
John Innes Kane Fund:				
Plant purchases and expenses	$ 1,516.48	1,776.22	1,957.04	1,335.66
Maria DeWitt Jesup Fund:				
Botanical collections and binding of books.....	1,345.95	1,256.64	2,224.54	378.05
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	436.82	150.80		587.62
Charles Budd Robinson Fund:				
Exploration	15.19	37.94	50.00	3.13
The H. H. Memorial Fund:				
Development of model gardens	324.34	251.33	189.77	385.90
Alexander P. Anderson and Lydia Anderson Fund:				
Research	633.07	502.66		1,135.73
Students' Research Fund:				
Scholarships and prizes.		356.68	300.00	56.68
	$ 4,271.85	$12,681.12	$11,444.06	$ 5,508.91
Special funds contributed for specific purposes:				
Contributions of trustees of Carnegie Corporation for program of public education	$ 8,628.70	$ 6,000.00	$12,670.72	$ 1,957.98
Bequest of William Gilman Thompson, designated by executive committee for construction of shelter house.....	5,000.00			5,000.00
Bequest of William C. Ferguson designated by the donor for mounting of museum specimens and purchase of museum equipment		3,956.48	181.16	3,775.32
	$13,628.70	$ 9,956.48	$12,851.88	$10,733.30
	$17,900.55	$22,637.60	$24,295.94	$16,242.21

REPORT OF THE COMMITTEE ON PATRONS FELLOWS AND MEMBERS FOR THE YEAR 1930

The Committee on Patrons, Fellows and Members for the year 1930 reports that the number of new members who have qualified is 176. The total number of Annual Members is now 1,827, a net increase of 14 during the year. There are at present 112 Life Members, one Fellowship Member and 20 Sustaining Members. Four persons have qualified as Life Members during the year by the payment of $250.00 each. Dues collected during the year amounted to $17,815.00. All sums have been transmitted to the Treasurer.

Of the Annual Members, 109 are now in arrears for dues for 1930; 48 for dues for 1929 and 1930; 31 for dues for the years 1928-1930 inclusive, and one for dues for the years 1927-1930 inclusive.

Benefactors

Edward D. Adams,
*Mrs. Fanny Bridgham,
*Hon. Addison Brown,
*Andrew Carnegie,
Columbia University,
*Hon. Charles P. Daly,
*James B. Ford,
*Daniel Guggenheim,
Murry Guggenheim,
Edward S. Harkness,
*Mrs. John Innes Kane,
*D. O. Mills,
*J. Pierpont Morgan, Sr.,
J. Pierpont Morgan,
John D. Rockefeller,
John D. Rockefeller, Jr.,
*Mrs. Russell Sage,
*Francis Lynde Stetson,
*Cornelius Vanderbilt.

Patrons

Oakes Ames,
Alexander P. Anderson,
Mrs. Alexander P. Anderson,
George F. Baker,
*Miss Catherine A. Bliss,
Dr. N. L. Britton,
*Hon. Addison Brown,
*Andrew Carnegie,
*Mrs. George Whitfield Collord,
*Mrs. Louisa Combe,
*James M. Constable,
*Charles Deering,
Henry W. de Forest,
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*Miss Mary A. Dill,
*William E. Dodge,
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*George J. Gould,
Edward S. Harkness,
*Mrs. Esther Herrman,
*Frederick Trevor Hill,
Archer M. Huntington,
*Henry Iden,
*Mrs. Helen C. Inslee,
*Mrs. John Innes Kane,
*John Stewart Kennedy,
*Mrs. Mary J. Kingsland,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
*J. Pierpont Morgan, Sr.,
*Oswald Ottendorfer,
*Lowell M. Palmer,
*William Rockefeller,
*William R. Sands,
*William C. Schermerhorn,
Mortimer L. Schiff,
*James A. Scrymser,
*Mrs. Mary C. Scrymser,
Mrs. Finley J. Shepard,
*Samuel Sloan,
*Mrs. Frederick F. Thompson,
*Dr. W. Gilman Thompson,
*W. K. Vanderbilt,
Mrs. Antoinette Eno Wood.

Fellows for Life

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George F. Baker,
Miss Elizabeth Billings,
Dr. N. L. Britton,
Mrs. N. L. Britton,
Mrs. Andrew Carnegie,
James W. Cromwell,
Mrs. W. Bayard Cutting,
Dr. Robert W. de Forest,
Childs Frick,
Murry Guggenheim,
S. R. Guggenheim,
William Halls, Jr.,
Mrs. William L. Harkness
Mrs. John Stewart Kennedy,
Prof. Frederic S. Lee,
Mrs. Frederic S. Lee,
J. Pierpont Morgan,
Mrs. Lewis R. Morris,
Mrs. George W. Perkins,
E. A. Richard,
Mrs. John A. Roebling,
Mortimer L. Schiff,
Leon Schinasi,
Mrs. Arthur H. Scribner,
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Charles G. Thompson,
Louis C. Tiffany,
Tiffany & Company,
Felix M. Warburg,
Mrs. William H. Woodin.

Life Members

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Dr. S. T. Armstrong,
Edward W. C. Arnold,
Mrs. Hugh D. Auchincloss,
Dr. John Hendley Barnhart,
George D. Barron,
Aurel Batonyi,
Gustav Baumann,
Henry Rogers Benjamin,
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William G. Bibb,
Miss Elizabeth Billings,
Mrs. Robert Woods Bliss,
George Blumenthal,
G. T. Bonner,
Mrs. Addison Brown,
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T. Morris Carnegie,
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Miss Ellen J. Stone,
Albert Tag,
Paul G. Thebaud,
Charles G. Thompson,
Robert M. Thompson,
Oswald W. Uhl,
Miss Anna Murray Vail,
F. T. Van Beuren,
Mrs. Cornelius Vanderbilt,
F. M. Warburg,
S. D. Webb,
John D. Wing,
Mrs. Anna Woerishoffer.

* Deceased.

Fellowship Member

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Sustaining Members

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Mrs. Walter S. Brewster,
Miss Mary T. Bryce,
Mrs. Zenas Crane,
John Greenough,
Mrs. E. V. C. Hawkes,
O. H. Kahn,
Mrs. Frida Merz Krollpfeiffer,
Edgar L. Marston,
George Grant Mason,
Mrs. George Nichols,
William Church Osborn,
Mrs. Mabel Prell,
Mrs. William K. Prentice,
Mrs. James T. Pyle,
Mrs. M. Taylor Pyne,
Mrs. Stanley Resor,
J. E. Spingarn,
Charles Strauss,
Arthur Hays Sulzberger.

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Mrs. L. Hosford Abel,
E. F. Abell,
Benjamin Abert,
Miss Elisabeth Achelis,
John Achelis,
C. E. Adams,
Mrs. Elbridge L. Adams,
F. B. Adams,
Henry S. Adams,
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Mrs. George B. Agnew,
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Mrs. Richard Aldrich,
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Mrs. W. H. Aldridge,
Sir Douglas Alexander, Bart.,
Mrs. John W. Alexander,
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Mrs. Earle Bailie,
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Mrs. James Baird,
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Miss Charlotte S. Baker,
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Mrs. George F. Baker, Jr.
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Mrs. Walter Beck,
Edmund R. Beckwith,
Mrs. William H. H.Beebe,
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Frank Begrisch, Jr.,
Mrs. A. Frederick Behre,
Dr. Otto F. Behrend,
Walter Beinecke,
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A. Beller,
Mrs. Belle W. Bendheim,
Alex. Benecke,
Andre L. Benel,
Mrs. William M. Benjamin,
Mrs. W. W. Benjamin,
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Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Descriptions of New Genera and Species of Plants Collected on the Mulford Biological Exploration of the Amazon Valley, 1921-1922, by H. H. Rusby; and The Flora of the Saint Eugene Silts, Kootenay Valley, British Columbia, by Arthur Hollick. viii + 464 pp., with 47 plates, 10 charts, and 11 text-figures. 1927.

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THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York, N. Y.

THE NEW YORK BOTANICAL GARDEN

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BULLETIN

OF

THE NEW YORK BOTANICAL GARDEN

ISSUED MAY 25, 1932

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BULLETIN
OF
The New York Botanical Garden

Vol. 14 No. 54

REPORT OF THE SECRETARY AND DIRECTOR-IN-CHIEF FOR THE YEAR 1931

TO THE BOARD OF MANAGERS OF THE NEW YORK BOTANICAL GARDEN.

Gentlemen:

In spite of unfavorable economic conditions the year just closed has been one of importance in the development of the work of the New York Botanical Garden. While it has not been possible for financial reasons to consummate all plans for expansion and betterment that have been suggested and discussed, it has been possible to initiate work on some of them.

Through our greatly increased staff due to the assignment of temporary help from the Emergency Work Bureau it has been possible to accomplish much that would otherwise have had to be left in abeyance. Beginning in November, 1930, when positions for unemployed women were created, starting with six employees, the number was very rapidly increased to about 90; the Garden was the first non-profit institution in New York to provide positions on a large scale for unemployed women. Some idea of the extent of the operations in reference to the unemployment situation may be gained from the statement that since this policy of creating positions for temporarily unemployed persons was initiated, no less than 131 women and 179 men have been given work, the women working six and later five days per week, the men three days per week. The maximum number of temporary women employees at any one time during the year was 90 and the minimum was 49. A monthly average of 80 men have been employed on tem-

porary status throughout the year. In selecting this temporary help we have had the full cooperation of the Emergency Work Bureau. A vast amount of routine and development work has thus been accomplished, the outside work on the part of the men consisting of grading, construction of paths, painting, clearing of large areas of land, particularly in the northern part of the Garden, preparation of lands for planting, removal of old trees and shrubs, and other general work of this type.

The inside work accomplished by the numerous temporary women employees has been continued along the lines initiated in November, 1930. This has included stenography and typing, general clerical work, preparation of indices and bibliographies, translating, proof-reading, library work, cleaning all public exhibits, poisoning and mounting herbarium material, repairing and cleaning mounted specimens, checking incoming and outgoing loans, distributing material into the general herbarium, acting as laboratory technicians and as general assistants to staff members, and initiating the work of a much-needed general rearrangement of the entire herbarium.

It is impossible in this brief report to indicate in detail what this has meant to the progress of the work of The New York Botanical Garden and what it has meant to the individuals who have been given employment. It has, however, served to indicate how understaffed The New York Botanical Garden is in reference to what it is attempting to do, a fact that has long been known to this Board. The very fact that so many individuals could be employed throughout the year for productive work that has long required attention, brings this situation into rather sharp relief. The employment of over 300 individuals, with an average of over 120 per month throughout the year, has of course entailed distinctly heavy burdens on staff members who have had to supervise this work, and has further involved very considerable expenditures to supply the equipment and material needed for this greatly increased staff,

for which budgetary provision could not be made in advance. Of necessity corporate funds needed for other purposes have had to be diverted to meet this unforeseen situation.

Many plans have been suggested to the directorate for the improvement and development of the Garden. In considering these proposals, due consideration must be given to what a botanical garden is or ought to be, and what limits are in force governing the expenditure of City funds and restricted endowment income.

The outside plantings should and must be improved, preserving at the same time a definitely balanced program between scientific and horticultural work, a program, however, difficult to establish on the basis of our present restricted income. The New York Botanical Garden annually devotes about two-thirds of its income to maintenance and garden work, and one-third to the support of its scientific activities—just the reverse of the situation in other institutions with which we might be compared. In the development of its garden work there are many difficulties to be surmounted as to soil and climatic conditions, as to the pressure caused by a not over-fastidious or over-tidy public, as to the deleterious influence of city smoke, gas, and dust, as to the unbalance of nature brought about by city conditions, thus permitting the excessive development of various insect pests without a corresponding increase in their natural enemies, and as to our relatively unguarded position because of the extensive and diversified grounds being open all hours, day and night, summer and winter—and, incidentally, The New York Botanical Garden is the only large institution of its kind in the world that is not closed to the public at night.

Stated in another way, there are two distinct phases of the subject: a local or "garden" phase appealing to the general public, to lovers of plants, to lovers of natural and artificial scenic effects, and, in general, to all lovers of nature; and a local, national, and international phase of service to

botanical science. In connection with the latter the scientific output should be improved and increased for, after all, this is the basis of the wider reputation of The New York Botanical Garden. My conception of the scientific work of The New York Botanical Garden is as wide as botanical science, and my conception of its field is as wide as the world. The Garden is more than a local institution and more than a national one—I look on its field as international, its work to be restricted only by the natural restriction of its material resources.

It is granted that the inside and outside ornamental plantings are not what they should be, but it is believed that they can and will be improved; but this is not a task that can be done overnight. It is also claimed that its library and herbarium resources are inadequate and that its scientific staff is not sufficiently large to handle all of the problems that arise. Both activities should be increased, but rapid progress in either branch is dependent on one thing—additional and for the most part unrestricted endowment, at least twice in excess of the present relatively small one. This means an additional endowment of approximately $5,000,000. For immediate needs the income from an additional endowment of at least $1,000,000 is imperative. Increased income could then be allocated to those numerous problems demanding solution, problems that will continue to remain with us indefinitely as long as the major part of the Garden income is subject to close restriction as now is the case.

I can conceive of no greater service to the general public, and particularly that great group of individuals interested in ornamental plants, than an intensive exploration of those parts of the world, particularly temperate and sub-temperate Asia, with the view to increasing the stock of ornamental herbs, shrubs and trees, that will thrive in the vicinity of New York City; yet no such exploration is possible at the present time because of the almost entire lack of funds available to support such work.

It should be constantly borne in mind by those interested in the Garden, its progress, service and development, that it, among its sister institutions in New York which are more or less similarly organized and which are supported on the basis of a City appropriation supplemented by income from endowment funds and from memberships, has an endowment much smaller than that of the three larger and older institutions—the Metropolitan Museum, the American Museum of Natural History, and the Zoological Society, and a smaller membership than any of the others; and yet it is obligated to maintain a garden of approximately 400 acres, rich in poor soil that has not been properly developed, and is burdened with the maintenance of extensive greenhouses and a large museum building, the bare maintenance of which constitutes a very heavy annual drain on the limited resources of the institution.

With regret it is recorded that the Garden lost the services of four members of the Board of Managers through death during the year, these being Mr. Edward D. Adams, May 20, 1931; Mr. Robert W. de Forest, May 6, 1931, and Mr. Mortimer L. Schiff, June 4, 1931. Appropriate resolutions were adopted by the Board of Managers covering each individual case. The staff also suffered the loss of one of its oldest and most productive members in the death of Doctor P. A. Rydberg on July 25, 1931. Biographical data regarding Dr. Rydberg and his services to botanical science have been prepared by Dr. Barnhart for publication in the Journal of The New York Botanical Garden.

GIFTS

In addition to gifts of publications, herbarium specimens, museum material and miscellaneous items, funds to the extent of $18,773.50 have been received, mostly for special purposes. These special gifts include $11,000 from the Carnegie Corporation, of which $6,000 is for continuance of work in education, $2,000, for an international address

book of botanists, and $3,000 for library equipment including a photostat; $2,949.50 from various members of the corporation for general support; $1,918 from Henry W. de Forest to support cooperative botanical exploration and an investigation of Louisiana *Iris;* an anonymous gift of $1,000 to be used in the installation of the perennial border; $700 from the National Academy of Sciences to support investigations in paleobotany; $506 from Dr. N. L. Britton for the purchase of botanical material; $250 from Mr. Childs Frick for general purposes; $150 from Mr. K. K. Mackenzie for the support of *Mycologia* and for initiating work on a reference seed collection; $150 from Mr. C. Lewis to support investigations on Louisiana *Iris;* $100 from Mr. A. G. Hodenpyl for the support of work in plant breeding; and $50 from the Bishop Museum to support work on the preparation of an index to the plant species of Polynesia.

The late Mortimer L. Schiff, a member of the Board of Managers of the New York Botanical Garden, bequeathed $20,000 to the institution to be added to its general endowment, and the Garden has received an unrestricted gift of $5,000 from the estate of the late Samuel R. Betts.

COOPERATIVE WORK

On the basis of the special gift of $1500 from Mr. Henry W. de Forest, it has been possible to initiate cooperative botanical exploration in China through Nanking University, Lingnan University and Sun Yatsen University. Dr. A. N. Steward reports a particularly successful season's exploration of Kweichow Province which was carried on by Nanking University in cooperation with The New York Botanical Garden and the Arnold Arboretum.

In cooperation with the Roerich Museum of New York, very extensive collections of herbarium material and numerous packages of seeds have been received from the Himalayan Research Institute of the Roerich Museum. Our Asiatic collections have been enriched by somewhat in excess of 2,000 mounted specimens from this source, the

identifications having been made for the Roerich Museum at The New York Botanical Garden. Through the interest and cooperation of Mr. A. D. Norcross and Captain Robert Bartlett, the Norcross-Bartlett expedition to Greenland secured an extensive and interesting collection of botanical material supplemented by several Wardian cases full of living plants which were successfully brought to the Garden.

In connection with a meeting of the American Association for the Advancement of Science at New Orleans December 28 to January 2, a special *Iris* exhibit was prepared with a view to calling attention to the remarkable development of this genus in the Mississippi delta. The exhibit consisted of a large series of unpublished watercolor paintings of *Iris*, an exhibition of the three *Iris* numbers of *Addisonia* with published colored plates and technical descriptions, the series of *Iris* papers published in the *Garden Journal*, and a special pamphlet consisting of descriptions of the species now known to occur in the southeastern United States, an excerpt from Dr. Small's forthcoming manual, "Flora of the southeastern United States."

VANDALISM

Between June 1 and September 6 the Garden was subjected to a series of distinctly destructive raids, involving a replacement damage to established shrubs and trees of several thousand dollars. These raids affected all parts of the grounds and always occurred at night. Much damage was done to a great variety of decorative deciduous and evergreen shrubs and trees, including many pines, Japanese cherries, magnolias, and other ornamentals, which were ruthlessly stripped and broken and in some cases entirely uprooted. In spite of the full cooperation of representatives of the City Secret Service Department, the individual who was doing the damage was not apprehended until three months after the raids commenced, and then by one of our own employees. On investigation it was found

that this individual, a gardener by profession, was mentally unbalanced and that he had taken this method to express his dislike of the police. Since the apprehension of this man no further damage has been done to the outside plantings. During the year in excess of 600 show labels were destroyed and very numerous labels were interchanged, this for the most part apparently being the work of irresponsible boys. These cases are mentioned merely to emphasize some of the difficulties faced in the maintenance of attractive plantings in a public garden open at all hours of the day and night, occupying a very uneven and diversified area of approximately 400 acres, which, subject to the pressure of a large and often non-critical public, renders the matter of proper protection, especially at night, exceedingly difficult.

BUILDINGS AND GROUNDS

In the Museum building, necessary replacements have been made in the main steam line and essential repairs to the building consummated. To provide additional office and work-room space, a partition was constructed across the end of the main floor, this alteration being made in connection with various changes in museum exhibits. Early in the year a new elevator was installed.

At Conservatory Range No. 1, all loose and broken glass was replaced. At Range No. 2, the interior and exterior of the display house and House No. 4 were painted, after all the glass on the roofs had been replaced. During the year it became necessary to construct a new roof on the shelter house at Lake No. 1. All necessary repairs were made at both power houses and a new boiler was installed at the propagating house.

A great deal of attention has been given to the grounds, the most striking improvement being the clearing of many acres along the Bronx River in the northern part of the Garden. This involved the removal of approximately 100 trees, mostly old willows, and the removal of the dense thickets of native shrubs that have characterized this area

for many years past. The improvement is very striking, particularly as one enters the Garden from the Bronx River Parkway, as there is no longer the sharp contrast, unfavorable to the Garden, between the well-kept Parkway and the previously unimproved part of the Garden adjoining the Parkway. In this same region the bank along the east side of the Garden contiguous to the railroad was graded and made ready for planting, covering an area about 800 feet in length and 75 feet wide, and the bank along the new wall, Bronx Park East, was graded for a distance of about 600 feet. About 3,500 yards of fill were placed at the south end of the large lake, but much more is needed to complete this project. Considerable attention has been given to paths, about 1,200 linear feet in various parts of the grounds having been resurfaced. In order to connect the 204th Street entrance with the north end of the Garden, a new path 300 feet in length was constructed, and on the east side of the grounds along the new wall, Bronx Park East, the existing path was moved out ten feet and rebuilt for a distance of 600 feet. A much-needed improvement was consummated when the Park Department, Borough of the Bronx, rebuilt the entire road from the Circle to the Arlington Avenue entrance. Many drains have been repaired, some replaced, and three new catch-basins have been constructed. In different parts of the grounds the one- and two-rail fences have been repaired and painted where necessary.

As in the past it became necessary to provide for special guards at the rose garden and at the dahlia collections during the summer months. During the past year, four uniformed policemen and two plain-clothes men were assigned to patrol work in the Garden. On Sundays and holidays ten men from our own staff were assigned to assist in this patrol work. During the year about 300 summonses were served by police officers for violation of Park ordinances. The number of visitors to the Garden has considerably increased during the past year.

GARDENS

In the outside ornamental plantings, distinct progress has been made. The rose garden was particularly successful, due partly to a favorable season, partly to a proper control of fungus disease, and partly to suggestions and material received from Mr. Bobbink. The extensive *Dahlia* collection of over 1100 plants and somewhat over 400 of the better named varieties was unusually attractive during the flowering season. The *Gladiolus* plantings were increased to about 1600 different forms, but due to a severe attack of thrips did not enjoy a particularly favorable season. The indoor and outdoor *Chrysanthemum* plantings were distinctly successful and it is now planned to increase the plantings of hardy forms through the establishment of new beds in areas that are generally accessible to the public. The *Iris* plantings have been maintained and increased. Approximately 9000 plants were added to the living collections of Louisiana *Iris* through the field activities of Doctor Small. The most attractive and extensive *Narcissus* plantings have been maintained and those in beds have been thinned and replanted; the large naturalistic planting near the Fordham entrance forms by far the most attractive early display at the Garden, there being between four and five acres in this one planting. Much progress has been made in the work of producing new hybrid forms of the day-lily and many thousand plants are now available for the establishment of permanent plantings. Two extensive plantings have already been made, one opposite Fordham Hospital, the other in the north meadow.

The tulip display was somewhat disappointing because of our inability to replant the plots with new bulbs. In 1932 a particularly fine display is anticipated, as the Holland Bulb Exporters Association presented 51,250 bulbs to the Garden, and to meet their conditions, all of the earth in the old plots was replaced with fresh soil before replanting. In general, the plantings about Range 1 have been distinctly improved through the interest of Mr. Stanley G. Ranger, a

member of the Garden, in securing plants new to the collections. An outstanding improvement in this part of the grounds was the actual installation of the long-discussed perennial border east of Range 1. This was accomplished by the Advisory Council under the leadership of Mrs. Arthur H. Scribner on the basis of detailed plans prepared by Mrs. Ellen Shipman, landscape architect.

To provide material for proposed extensions of the out-of-doors plantings of ornamental shrubs, approximately 15,000 cuttings are now being rooted in the propagating house, while 30 plats have been sown with *Rhododendron* and *Azalea* seeds. The north part of the Garden along the Bronx River, wholly undeveloped, consisting of many acres of low but particularly rich land, has been cleared, preparatory to development. A part of this recently cleared area will be devoted to a series of ornamental gardens, to be developed in cooperation with the recently organized New York Botanical Garden Floricultural Association.

The inside collections have been enriched by numerous gifts, including important donations of *Pelargonium* and *Fuchsia* from Mr. W. H. Webster, *Begonia* from Mrs. H. H. Buxton and Mrs. A. H. Thomas, 120 varieties of *Hibiscus* from W. R. Coe, numerous *Chrysanthemum* varieties from Mr. E. D. Smith, and about 100 species of tender *Rhododendron* from Mr. Clarence Lewis. Outside of these special groups, 571 individual plants, representing nearly as many species, have been presented by Mr. W. H. Webster. The total number of plants in the conservatories at the end of the year was approximately 30,000. For all plantings the total number of plants received during the year was 5,604, to which should be added 1,498 packets of seeds for propagation.

The Garden is under particular obligation to Mr. Stanley G. Ranger and to Mr. W. H. Webster for their generous gifts of special material, to Mr. A. D. Norcross and Captain Robert Bartlett for securing and bringing to the Garden an interesting lot of characteristic Greenland plants, and to

the Himalayan Research Institute of the Roerich Museum for supplying seeds of characteristic Himalayan species. Mr. L. C. Bobbink has continued his interest in the rose garden, the entire outside border being changed at his suggestion, and numerous new types added to the collection through his generosity. The rose garden now contains about 700 varieties represented by about 6,000 plants. About 700 plants have been added to the rock garden collection.

Five thousand and forty-nine new show labels, principally for *gladioli, roses,* and *dahlias,* and the conservatory collections, were made, and with the assistance of Emergency Relief, 7,000 data labels were cleaned.

SUMMARY

Accessions:

Plants received	5,604
Seeds (packets) received	1,498

Status of the conservatory collection of living plants:

Range No. 1	10,289
Range No. 2	9,339
Propagating House	9,303
Total	28,931

Displays:

	Plants	*Varieties*
Tulip	43,150	97
Hyacinth	8,100	7
Narcissus	500,000	150
Iris	11,852	2,249
Southern Iris	5,230	
Peony	713	448
Rose	6,086	700
Dahlia	1,100	400
Chrysanthemum		268

	Plants	*Varieties*
Canna	1,060	64
Lilac	560	85
Mallow	560	
Dwarf plantation	66	28
Fall flowering shrubs	85	11
Gladiolus	15,000	1,500
Rock gardens	5,700	
Eremurus	44	11
Flowering Plants for display at Range No. 2:		
Chrysanthemums	300	180
Pelargoniums	120	
Fuchsias	141	
Gloxinias	60	
Hydrangeas	50	
Cyclamens	185	
Hibiscus	583	120
Show labels	5,049	
Pot and herbaceous ground labels cleaned	7,000	

IRIS AND NARCISSUS COLLECTIONS

As in the past, Mrs. Ethel Anson S. Peckham has continued to take charge of these plantings. The extensive *Narcissus* plantings have been maintained and improved. The *Iris* plantings showed improvement as a result of treatments for the control of various diseases, replantings, and the general good care they have since received. Extensive additions have been made to the living collections by gifts from the following individuals and organizations: Mr. E. J. Alexander, Mr. E. Auten, Jr., Beacon Road Flower Garden, Mrs. M. E. Black, Mrs. W. C. Brinton, Mr. F. W. Campbell, Mr. J. De Winkeler, Mrs. C. Dormon, Mr. H. F. du Pont, Mr. L. J. Egelberg, Fairmount Iris Gardens, Fairy Gardens, Mr. J. N. Giridlian, Miss L. Given, Mr. R. W.

Gottschall, Mr. J. H. Grinter, Mrs. C. F. Groth, Dr. J. E. Hill, Mr. V. V. Johnson, Miss L. Kannapell, Kenwood Iris Gardens, Mr. E. G. Lapham, Longfield Iris Farm, Meadow Mountain Bulb Farm, Mrs. H. O'Connor, Mr. F. C. Morgan, Over The Garden Wall, Mr. A. W. Peckham, Mrs. W. H. Peckham, Mr. A. Perry, Mr. H. A. Rankin, Mrs. J. M. Richer, Mr. Jacob Sass, Capt. L. Schmidt, Dr. J. K. Small, Southland Iris Garden, Mr. Carl Starker, Mrs. C. H. Stout, Miss G. Sturtevant, Mr. R. Wayman, Dr. E. S. Wherry, Mr. E. B. Williamson and Mr. J. C. Wister.

The extensive living collections of Louisiana and Florida *Iris* secured by Dr. Small have been assiduously cared for, the seeds have been bagged and collected, and seedlings planted in the nursery.

PLANT PATHOLOGY

Continual attention has been given to the control of plant diseases and insect pests throughout the year and spraying has been resorted to wherever necessary. The results of the spraying campaigns carried on in the past few years are now evident in the better condition of numerous special plantings. Even the fungus diseases that were so disastrous in the rose garden in previous years have been brought under control. Papers on a cedar rust, on the life histories of the rose black-spot fungus and fungi pathogenic to human beings, on the genetics and physiology of fungi commonly found in bakeries, and on the boxwood fungus, are among those that have been prepared during the year. The proper control of certain insect pests is still a problem at the Garden. A survey of the larvae working in the garden lawns and flower beds indicates that the Japanese beetle is still, fortunately, rather rare. The Asiatic garden beetle is, however, becoming more noticeable. The larvae of this and of one of the May beetles are mainly responsible for killing the grass in certain lawns. Further cooperation with representatives of the United States Department of Agriculture is planned, to test the efficiency of arsenate con-

trol of the May beetle. The bag-worm, pine-bark louse, tulip poplar scale, and the gladiolus thrips were among the insects requiring special attention during the past season, and a satisfactory control for the latter is still being sought.

GENERAL HERBARIUM

The herbarium work has progressed in a most satisfactory manner, due partly to the abundance of extra assistance granted the Garden from the Emergency Work Bureau. It so happened that the work of poisoning, mounting, repairing, and cleaning herbarium material was very badly in arrears because of inadequate financial support for this important activity in preceding years, and this was a type of work to which untrained and inexperienced individuals could be assigned to work under direction.

Through purchase, exploration and exchange, about 84,000 specimens have been added to the general collections. Approximately 95,000 recently mounted specimens were incorporated in the general herbarium, this material coming from all parts of the world but chiefly from North and South America. During the year the general and local herbaria were greatly enriched by the presentation of the K. K. Mackenzie herbarium estimated to contain in excess of 60,000 specimens. Another important accession was a series of 3,500 duplicates of the Richard Spruce Upper Amazon collections made between the years 1849 and 1864, received in exchange from Cambridge University, thus making this most important historical collection more generally available to American botanists. Another important accession was the late Alwin Berger's herbarium of succulent plants presented by Dr. N. L. Britton.

Rapid advances have been made on an innovation in herbarium practice initiated during the preceding year, which is the incorporation of clipped or typed original descriptions and critical notes with the herbarium specimens. No definite record has been kept of the number of

items added, but it is estimated to be in excess of 150,000. The advantages in bringing such data in juxtaposition with the actual specimens are obvious.

Excellent progress is being made in rearranging the entire herbarium of flowering plants, estimated to contain in excess of 1,500,000 sheets. All oriental material has been segregated and rearranged, and much progress has been made on the general collections from North and South America and elsewhere. This rearrangement of the material, following major geographic units, will make the specimens much more readily accessible.

In connection with our cooperative work with various institutions in America and Europe, a total of 5,476 herbarium sheets have been loaned to specialists in thirty-one institutions for study, and 4,037 sheets have been borrowed from twenty-two other institutions for the use of individuals working at The New York Botanical Garden.

MOSSES

About 1,000 specimens of mosses have been received and added to the collections during the year, and various duplicates have been distributed to individuals and to institutions.

ALGAE

While the task of proof-reading the late Dr. Rydberg's "Flora of the prairies and plains of Central North America" devolved on Dr. Howe and naturally interfered with his own program, general work on the classification of algae and the incorporation of material in this special herbarium has been continued. Dr. Howe also supervised the extensive Dahlia plantings as in past years, the living collections during the season containing about 400 of the better varieties represented by 1,100 plants.

FUNGI

Much progress has been made in mounting and arranging mycological material, and in connection with this work more than 10,000 specimens from duplicate sets of exsiccatae have been arranged for reference in book form. The subscription price for *Mycologia* was increased from $4 to $5 per volume in order to secure the revenue necessary to increase the size of this publication. The forty-seven new subscribers added during the year assisted in this program, the net result being that in spite of the increased size of this periodical, the cost of publication was approximately covered from receipts.

LOCAL HERBARIUM

The local herbarium has been more than doubled in size during the past year, now containing approximately 50,000 mounted specimens. Its rapid increase was due to the incorporation of the Bicknell Herbarium, the Ferguson Herbarium of Long Island plants, the Miller Collection of New Jersey plants, and material presented by Mr. Harold Moldenke. The largest single accession of the year was the New Jersey material from the herbarium of K. K. Mackenzie, as mentioned above.

The entire local herbarium has been reorganized and rearranged and all material is now stored in modern insect-proof and dust-proof steel cases provided for by a bequest received in 1930 under the will of the late W. C. Ferguson.

PALEOBOTANY

All paleobotanical collections have been thoroughly dusted and cleaned as a routine task and research has been prosecuted on the Tertiary flora of Alaska, Tertiary cycads, Triassic flora of Staten Island, and on Pleistocene remains from the upper Connecticut River valley. A grant of $700 was received from the National Academy of Sciences to support investigations on the paleobotany of Cuba. Material received from various sources has been accessioned.

ECONOMIC COLLECTIONS

The major task in caring for the economic collections, following the cleaning and renovation of the cases and containers, has been the completion of the manuscript for the new labels. In connection with this work, it developed that many specimens listed in the catalogue were lost or misplaced, or had deteriorated to such a point that they were no longer of value for exhibition purposes and had been removed. A special list of these *desiderata* was prepared and steps have been taken to secure the necessary replacement material. The installation of the Rudolph Block collection of walking sticks necessitated a breaking of the sequence in the museum cases and the removal of some of them to the basement, a necessity that again emphasizes our need for additional museum space. Other cases in the economic collections were found to be badly overcrowded, but during the year it has been possible to provide some additional space for the fruit collection. Late in the year, the Museum received from the Viscose Company of New York a collection of samples illustrating the manufacture of rayon. This donation showing the method of production added greatly to the educational value of the exhibit covering this project already installed.

MUSEUM

Some important adjustments have been made in the public exhibits. The most important addition was the Rudolph Block collection of walking sticks, representing 1,400 named woods from all parts of the world. This collection had been on exhibition at the United States National Museum for three years but Mr. Block desired to have it placed on display in New York, and accordingly the Garden accepted it on deposit. An extensive description of this collection was contributed to the November number of the *Journal* of The New York Botanical Garden by Professor Samuel Record. He emphasizes the fact that the collection is not so much an exhibition of walking sticks as it is of woods represented in

them, there being 950 different authentically named species represented. To provide case space for this collection, the exhibit cases on the main floor were rearranged and those formerly used for the wood collections were adapted to this special exhibit. On the basement floor the remaining cases in the east wing of the main floor were installed along the center aisles to receive the wood collection, and the basement exhibit room was further improved by the installation of the eleven-foot section of the California Big Tree received during the preceding year. Through the interest of Dr. Dodge, an interesting exhibit of fungi pathogenic to man has been maintained throughout the year.

Special exhibits arranged during the year included one of selected old botanical literature, the Greenland plants collected by the Norcross-Bartlett Expedition, and an exhibit of paintings of plants and scenery under the auspices of the Bronx Artists' Guild. In November a special exhibit illustrating materials and methods used in teaching was prepared in cooperation with the Torrey Botanical Club and the New York Biology Teachers' Association.

LABORATORIES

Cooperation in lily disease investigations has continued along the lines of the agreement mentioned in previous reports. In the breeding of *Iris*, some promising seedlings have been obtained. The accumulation of living plants of southern *Iris* at the Garden now gives us an opportunity for further breeding work in this interesting and attractive group. Excellent progress has been made in the breeding of day-lilies, forms with pink and distinctly red flowers having been developed, while several unusual types remarkable for stature have appeared in the plantings, some with scapes as tall as eight feet.

Cooperation with the New York Agricultural Experiment Station during the year has been confined to the project of breeding new, hardy, seedless grapes, and over 2,000 seedlings are now being grown in connection with this project

at Geneva. Investigations with poplars with the view to developing varieties of more rapid growth has temporarily been discontinued.

LIBRARY

The library contained 41,714 bound volumes at the end of the year, an increase of 689 over 1931. These accessions were secured by purchase, gift, exchange, and by binding periodicals, the accessions however being fewer than for any single year in recent times. By subscription and exchange, fourteen new periodicals have been added to the library. The usual number of additions have been made to the subject and author card-catalogue, the additions totaling 9,135 in all categories. It is unfortunate that the financial situation of the Garden does not permit it to take advantage of the very favorable conditions that now exist for the purchase of books and thus more rapidly increase this fundamentally important adjunct to the institution.

PHOTOSTAT

On the basis of a special grant received from the Carnegie Corporation, a photostat was purchased and installed during the year and is now in operation. This is a most important addition to our library equipment, enabling us to supply reproductions of any printed page or illustration at moderate rates to botanists or institutions, thus making available to a very wide public the extensive library resources of the Garden.

BIBLIOGRAPHY

The usual assistance has been extended to individuals using the library, this being extended not only to employees of the Garden but also to numerous visitors. Book purchases have been such as appropriations warranted, with due consideration for the economies requested in the latter part of the year. Five parts of the North American Flora have been published, comprising 355 pages; two more parts

are in type, and a third is in the hands of the printer. Two interesting exhibitions of books in the library, one of two weeks' duration, the other for a single day, were installed in connection with other exhibits.

PUBLICATIONS

The total receipts from subscriptions and sales of publications were $6,578.21, an increase of $804.26 over the preceding year. The various numbers of the regular serials of the Garden were issued as usual; of the *Journal* 12, of *Mycologia* 6, of *Addisonia* 4, and of the *Bulletin* 1. Of the irregular publications, two numbers of *Brittonia* were issued, five numbers of *North American Flora*, and nine numbers of the *Contributions*, that is, reprints from periodicals. The work of proof-reading on the late Dr. Rydberg's "Flora of the prairies and plains of Central North America," a volume of about 969 pages, was practically completed in December and the volume will appear early in 1932 as an official publication of the Garden. It is gratifying to note that the regular subscriptions received nearly cover the cost of printing two of our serials, the *North American Flora* and *Mycologia*, a distinctly unusual situation for this type of technical material.

PUBLIC EDUCATION

Public lectures were continued as in the past, 47 having been given in the Garden series, of which 33 were by staff members. The total attendance at all lectures was 4,989. The attendance at the winter lectures in Range 2 continues to exceed the seating capacity. Sixty-three lectures were given before outside organizations by staff members during the year. Guidance for students and parties of visitors has been continued as in the past, attended by 4,227 individuals.

An innovation during the year has been the initiation of special gardening courses, primarily for members of the Garden who desire to gain personal information as to how

best to propagate and grow ornamental plants. The popularity of these courses is very evident from the attendance and the interest displayed. It is a distinct service to members of the Garden, to garden organizations, and other interested parties, and this type of work should be amplified.

INTERNATIONAL ADDRESS BOOK OF BOTANISTS

The Fifth International Botanical Congress held at Cambridge, England, at its final plenary session, appointed a special committee consisting of Prof. Dr. L. Diels, Director, Botanic Gardens, Berlin, Dr. T. F. Chipp, Assistant Director, Royal Botanic Gardens, Kew, and the undersigned to arrange for the preparation and publication of a new botanical address book. A special grant of $2,000.00 was made by the Carnegie Corporation through The New York Botanical Garden to cover the preliminary expenses in connection with the project. To the undersigned was assigned all of North America, certain parts of the West Indies, certain countries in South America, the Philippines, and all of Polynesia. The assembled data covering these regions were transmitted to Kew, and the book, a volume of 605 pages, containing in excess of 13,000 entries, was published for the Bentham Trustees during the year by Messrs. Baillière, Tindall and Cox of London.

SCIENTIFIC DIRECTORS

Doctor R. A. Harper, Chairman of the Scientific Directors, reports that the regular meetings have been well attended. With regret the loss of Doctor Barrington Moore as a member of the Scientific Directors is recorded. Doctor Moore's services to the Garden, owing to his special training and great interest in problems of forestry, have been of very great value, especially in connection with the work of the committee which has been studying the problems of conserving and developing the hemlock grove. Doctor Moore's removal from the country has made it impossible for him to continue his active service, but he has expressed his con-

tinued interest in the work of the Garden. Doctor Raymond F. Bacon has accepted membership in the Scientific Directors to fill the vacancy caused by Doctor Moore's resignation. For the greater convenience of the members it was decided to hold the two winter meetings at Columbia University, the spring and fall meetings to be held as hitherto at the Garden.

The Scientific Directors have discussed at length many plans for the further development of the educational, scientific, and especially the horticultural work of the Garden, and this group looks forward with great interest to the development of the further plans now being considered for concrete progress in these lines during the coming year.

BIBLIOGRAPHY OF STAFF MEMBERS

In a measure an annual bibliography of staff members gives some idea of individual members' activities. Accordingly the following data covering technical and semi-technical papers by staff members published in 1931 are presented.

Alexander, E. J. Clintonia borealis. Addisonia **15**: 51, 52. *pl. 506;* Pueraria Thunbergiana. 57, 58. *pl. 509;* Gilia rubra. 63, 64. *pl. 512;* Sparganium androcladum. **16**: 17, 18 (89-90). *pl. 521;* Ampelopsis heterophylla. 35, 36. *pl. 530;* Sabbatia campanulata. 41, 42. *pl. 533;* Lantana Sellowiana. 47, 48. *pl. 536;* Billbergia iridifolia. 49, 50. *pl. 537;* Pyrostegia venusta. 59, 60. *pl. 542;* Rondeletia odorata. 63, 64. *pl. 544.* 1931.

————(with **Small, J. K.**) Botanical interpretation of the iridaceous plants of the Gulf States. Contr. N. Y. Bot. Gard. 327: 325-357. *fig. 1-7.*

Barnhart, J. H. [Biographical notes.] Jour. N. Y. Bot. Gard. **32**: 1, 3, 5, 34, 36, 41, 213, 215, 218, 220. (Mark Catesby, Charles Sprague Sargent, Allan Hiram Curtiss, Nathaniel A. Ware, Thomas Nuttall, Frederick Lewis Lewton, Alvah Augustus Eaton, Abram Paschall Garber, William Hemsley Emory, William Phipps Blake, James Graham Cooper, Hermann Wendland, Sereno Watson, Jean Jules Linden, Karl Ernst, Otto Kuntze, George Bishop Sudworth, Edward Palmer).

————Pinguicula Jackii. **Addisonia 15.** 61, 62. *pl. 511.*

———Per Axel Rydberg. Jour. N. Y. Bot. Gard. 32: 229-233. *pl. 306* (*portrait*).

———Lentibulariaceae [of the Tyler-Duida Expedition.] Bull. Torrey Club 58: 468, 469.

———Significance of John Bartram's work to botanical and horticultural knowledge. Bartonia 12: Suppl. 24-34.

———John Bartram's first interest in botany. Bartonia 12: Suppl. 35-37.

———Bartram bibliography. Bartonia 12: Suppl. 51-67.

Boynton, K. R. Crocus vernus. Addisonia 16: 75, 76. *pl. 514;* Eranthis Tubergenii. 77, 78. *pl. 515;* Scilla sibirica atrocoerulea. 79, 80. *pl. 516;* Rosa rugosa. 91, 92. *pl. 522;* Cobaea scandens. 99, 100. *pl. 526;* Anemone hupehensis. 33, 34. *pl. 529;* Tagetes lucida. 37, 38. *pl. 531;* Iberis amara. 43, 44. *pl. 534;* Dendrobium fimbriatum oculatum. 53, 54. *pl. 539;* Acacia podalyriaefolia. 57, 58. *pl. 541;* Paphiopedilum insigne Sanderae. 61, 62. *pl. 543.*

Britton, N. L. Recent scientific observations in Porto Rico. Jour. N. Y. Bot. Gard. 32: 185-193.

———Cyperaceae [of the Tyler-Duida Expedition] Bull. Torrey Club 58: 317.

———Caesalpinaceae [of the Tyler-Duida Expedition] Bull. Torrey Club 58: 371.

———Additions to knowledge of Mexican Cactaceae. Cactus & Succulent Jour. 3: 22.

———The Cactaceae of Tehuacan. Jour. Cactus & Succulent Soc. 2: 422.

———On Byrnesia Weinbergii. Jour. Cactus & Succulent Soc. 2: 414.

Chandler, C. A method for staining pollen-tubes within the pistil. Stain Technology 6: 25, 26.

Dodge, B. O. Inheritance of the albinistic non-conidial character in interspecific hybrids in Neurospora. Mycologia 23: 1-50. *pl. 1-7.*

———A destructive red-cedar rust disease. Jour. N. Y. Bot. Gard. 32: 101-108. *fig. 1-3.*

———Gladiolus badly infested with thrips. Jour. N. Y. Bot. Gard. 32: 205-210. *fig. 1.*

———A further study of the morphology and life history of the rose blackspot fungus. Mycologia 23: 446-462. *pl. 33-35.*

———Heterothallism and hypothetical hormones in Neurospora. Bull. Torrey Club. 58: 517-522. *fig. 1.*

———(with **Emmons, C. W.**) The ascocarpic stage of species of Scopulariopsis. Mycologia 23: 313-331. *pl. 25-28.*

Gleason, H. A. Scientific expedition to Venezuela. Jour. N. Y. Bot. Gard. 32: 108-113.

————Johnson's Taxonomy of Flowering Plants (review). Torreya 31: 77-84.

————Three recent books on plant geography (review). Jour. N. Y. Bot. Gard. 32: 162-164.

————The relationships of certain myrmecophilous melastomes. Bull. Torrey Club 58: 73-85.

————Recent collections of Melastomataceae from Peru and Amazonian Brazil. Bull. Torrey Club 58: 215-262.

————(with numerous collaborators) Botanical results of the Tyler-Duida Expedition. Bull. Torrey Club 58: 277-506. *pl. 27-45. fig. 1-8, map.*

————(with **Anthony, H. E.** and **Platt, R. R.**) The Pacaraima-Venezuela Expedition. Geogr. Rev. 21: 353-362.

Hollick, A. Plant remains from a Pleistocene lake deposit in the upper Connecticut River valley. Brittonia 1: 35-55. *pl. 1-11.*

————The big trees of California. Journ. N. Y. Bot. Gard. 32: 238-240.

————Records of Triassic fossils on Staten Island, New York, with descriptions of specimens. Proc. Staten Isl. Inst. Arts Sci. 6: 5-22. *pl. 1-9.*

Howe, M. A. Dahlias are plants of American origin. Bull. Am. Dahlia Soc. 12: 4-7.

————Botanical exploration of the Island of Hainan. Jour. N. Y. Bot. Gard. 32: 45, 46.

————Notes on the algae of Uruguay. Bull. Torrey Club 57: 605-610. *pl. 37.*

————(with **Taylor, W. R.**) Notes on new or little-known marine algae of Brazil. Brittonia 1: 7-33. *pl. 1, 2.*

Merrill, E. D. On the desirability of an actual examination of extant types of Chinese species. Sinensia Spec. Bull. 1: 1-10.

————One name periodicals. Brittonia 1: 1-5.

————The local residents' opportunity for productive work in the biological sciences in China. Lingnan Sci. Jour. 7: 293-296.

————Unrecorded plants from Kwangtung Province, II. Lingnan Sci. Journ. 7: 297-326.

————An appreciation of the Rijks Herbarium. Meded. Rijks Herb. Leiden 65: 1-3.

————The phytogeography of cultivated plants in relation to assumed pre-Columbian Eurasian-American contacts. Am. Anthropol. 33: 375-382.

————A plea for the publication of a bibliography of the flora of China. Rep. Proc. Fifth Int. Bot. Congr. Cambridge 528-533.

———(with **Diels, L., and Chipp, T. F.**) International address book of botanists, being a directory of individuals and Scientific Institutions, Universities, Societies, etc., in all parts of the world interested in the study of botany. i-xv, 1-605.

Rusby, H. H. Will our chestnut tree return? Jour. N. Y. Bot. Gard. 32: 11-13.

———The largest cactus. Jour. N. Y. Bot. Gard. 32: 193, 194.

———Vegetable drugs and medicines. Jour. N. Y. Bot. Gard. 32: 234-237.

———Some questions of pharmacopoeial interpretation. Jour. Am. Pharm. Assoc. 20: 277-282. The Messenger, 8: 62-70.

———Matico and its substitutes. III. The Messenger 8: 181, 182.

———Some fallacies of quantitative biological testing. Jour. Am. Pharm. Assoc. 20: 266, 267.

———Proceedings of the celebration of the 300th anniversary of the discovery of the uses of Cinchona. Jour. Am. Pharm. Assoc. 20: 1147-1152.

———The genus Cinchona in Bolivia. Bull. Torrey Club 58: 523-530.

Seaver, F. J. A rare phalloid from the New York Botanical Garden. Mycologia 23: 83, 84. *pl. 8.*

———Photographs and descriptions of cup-fungi XIV. A new genus. Mycologia 23: 247-251. *pl. 23, 24.*

———Photographs and descriptions of cup-fungi XV. The giant Elvela. Mycologia 23: 409, 410. *pl. 29.*

Small, J. K. The brittle thatch — Thrinax microcarpa. Jour. N. Y. Bot. Gard. 32: 1-6.

———Palms of the continental United States. Sci. Monthly 32: 240-255.

———The fanleaf-palm — Washingtonia filifera. Jour. N. Y. Bot. Gard. 32: 33-43.

———Altitudinal distribution of eastern American Iris. Jour. N. Y. Bot. Gard. 32: 49-66.

———Botanical crossroads, historic and prehistoric. Jour. N. Y. Bot. Gard. 32: 92-94.

———The water-lilies of the United States. Jour. N. Y. Bot. Gard. 32: 116-121.

———Iris verna. Addisonia 16: 87, 88. *pl. 520;* Biltia Vaseyi. 97, 98. *pl. 525.*

———The cypress, southern remnant of a northern fossil type. Jour. N. Y. Bot. Gard. 32: 125-135.

———Bartram's Ixia coelestina rediscovered. Jour. N. Y. Bot. Gard. 32: 155-161.

———Salvaging the native American Iris. Jour. N. Y. Bot. Gard. 32: 175-184.
———The wild pepper plants of the continental United States. Jour. N. Y. Bot. Gard. 32: 210-223.
———Celestial lilies. Jour. N. Y. Bot. Gard. 32: 260-269.
———Vanishing Iris. Jour. N. Y. Bot. Gard. 32: 277-288.
———(with Alexander, E. J.) Botanical interpretation of the iridaceous plants of the Gulf States. Contr. N. Y. Bot. Gard. 327: 325-357. *fig. 1-7.*

Smith, A. C. Studies of South American plants I. Bull. Torrey Club 58: 87-110.
———Pteridophyta [of the Tyler-Duida Expedition]. Bull. Torrey Club 58: 299-315. *pl. 22, 23.*
———Ericaceae and Vacciniaceae [of the Tyler-Duida Expedition]. Bull. Torrey Club 58: 436-444. *pl. 36.*
———(with Killip, E. P.) The South American species of Viburnum. Bull. Torrey Club 57: 245-258.
———(with Killip, E. P.) The uses of fish poisons in South America. Smithsonian Report for 1930: 401-408. *pl. 1-5.*

Stout, A. B. The inter-relations between vegetative propagation and seed reproduction. Rep. Proc. Internat. Hort. Congr. 1930: 187-196.
———The landscape values of daylilies. Arts and Decoration 34: no. 5. March.
———Emil Godfred Arzberger. Phytopathology 21: 345, 346.
———Plant hybrids. Jour. N. Y. Bot. Gard. 32: 73-92.
———Pollen-tube behavior in *Brassica pekinensis* with reference to self-incompatibility in fertilization. Am. Jour. Bot. 28: 686-695.
———Notes on new hybrid daylilies. Jour. N. Y. Bot. Gard. 32: 25-33.

Swift, M. E. "Crazed" crockery and other strange habitats of moulds. Jour. N. Y. Bot. Gard. 32: 149-154. *fig. 1, 2.*

Williams, R. S. Colombian mosses, apparently undescribed. Bryologist 33: 73-77. *pl. 10-14.*
———Homalia Sharpii sp. nov. Bryologist 34: 20. *pl. 2.*
———Blindia Roerichii sp. nov. Bryologist 34: 50, 51. *pl. 3.*
———Musci [of the Tyler-Duida Expedition.] Bull. Torrey Club. 58: 501-503. *pl. 44, 45.*

E. D. MERRILL,
Director-in-Chief.

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1931

EXHIBIT I

BALANCE SHEET

December 31, 1931

JOHN L. MERRILL, Treasurer

Assets

Permanent Fund Assets:			
Investments at cost or appraisal at time of acquisition (Exhibit III)	$2,362,916.57		
Cash awaiting investment	28,148.68		
		$2,391,065.25	
Balance of permanent fund assets expended for current uses (see current fund liability per contra)		45,703.09	
			$2,436,768.34
Current and Working Assets:			
Cash in banks and on hand:			
For account of life beneficiary....	$ 162.72		
Special purposes	12,309.06		
		$ 12,471.78	
Accounts receivable:			
City maintenance	$ 31,025.86		
Special purposes	376.60		
		31,402.46	
Interest and dividends receivable (Exhibit III)		29,757.39	
Prepaid insurance premiums, etc..		2,666.01	
			76,297.64
			$2,513,065.98

EXHIBIT I

BALANCE SHEET

December 31, 1931

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 197,929.47	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,217,680.05	
Special endowment, with life interest in respect of income therefrom..		21,158.82	
			$2,436,768.34
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable	$ 11,698.10		
Income due to life beneficiary....	162.72		
		$ 11,860.82	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 4,842.48		
Unexpended contributions set aside by the Board of Managers for specific purposes.....	7,843.18		
		12,685.66	
Deferred income credits:			
Membership dues paid in advance	$ 330.00		
Subscriptions and fees paid in advance	1,124.20		
		1,454.20	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses...		45,703.09	
Working Fund:			
Working fund at Dec. 31, 1930..	$ 6,957.47		
Less—Excess of expenditures over income for the year ending December 31, 1931 (Exhibit II)	2,363.60		
		4,593.87	
			76,297.64
			$2,513,065.98

CERTIFICATE OF AUDITORS

We have made an examination of the books and accounts of The New York Botanical Garden for the year ending December 31, 1931, and, in our opinion, the attached balance sheet (Exhibit I) and relative statements (Exhibits II-V, inclusive) are properly prepared therefrom and set forth the financial position of the corporation as at December 31, 1931, and a summary of the transactions for the year ending on that date.

PRICE, WATERHOUSE & Co.

56 Pine Street, New York, March 31, 1932.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1931

	City maintenance	General	Restricted and special funds	Total
Income:				
Income from investments of permanent funds		$116,972.21	$ 9,687.44	$126,659.65
Contributions	$274,520.00	3,303.82	14,348.97	292,172.79
Membership dues:				
Annual		14,660.00		14,660.00
Sustaining		3,010.00		3,010.00
Sales of duplicate books and sundries		1,947.75		1,947.75
Subscriptions and sales of publications		4,413.61	2,164.60	6,578.21
Total income	$274,520.00	$144,307.39	$ 26,201.01	$445,028.40
Expenses:				
Maintenance and general expenses:				
Salaries of director-in-chief, assistants and garden staff	$189,667.50	$ 99,618.96	$ 5,626.35	$294,912.81
Wages	38,752.50	18,353.05		57,105.55
Materials and supplies	46,100.00	4,408.88	50.00	50,558.88
Stationery, printing, postage, etc.		4,111.52	526.83	4,638.35
Investment custody fees		342.64		342.64
Insurance		2,688.78		2,688.78
Miscellaneous		3,419.17		3,419.17
	$274,520.00	$132,943.00	$ 6,203.18	$413,666.18
Improvements and exhibits:				
Improvements to buildings and grounds			$ 348.64	$ 348.64
Museum equipment purchased		$ 40.32		40.32
Herbarium equipment purchased		130.43	3,775.32	3,905.75
Library equipment purchased			2,883.67	2,883.67
Laboratory equipment purchased		492.55		492.55
Maintenance equipment purchased		63.20		63.20
Library books, binding, etc.			4,212.46	4,212.46
Museum specimens		1,339.74	2,076.00	3,415.74
Plant purchases and expenses			1,066.31	1,066.31
Expenses of model gardens			535.00	535.00
		$ 2,066.24	$ 14,897.40	$ 16,963.64
Education and research:				
Public lectures and instruction		$ 190.06	$ 1,822.35	$ 2,012.41
Scholarships, prizes, etc.			150.00	150.00
Publications		10,704.88	4,831.93	15,536.81
Botanical exploration		84.20	1,852.70	1,936.90
Traveling expense		682.61		682.61
		$ 11,661.75	$ 8,656.98	$ 20,318.73
Total expenses	$274,520.00	$146,670.99	$ 29,757.56	$450,948.55
Excess of expenses over income for the year		$ 2,363.60	$ 3,556.55	$ 5,920.15

EXHIBIT III

Summary of Investments, December 31, 1931

	Par value (no par value stocks at book value)	Approximate quoted value	Book value	Accrued interest and dividends December 31, 1931	Average yield per year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds	$ 539,800.00	$ 461,876.00	$ 525,548.28	$ 7,113.00	5.61	4.93
Stocks:						
Preferred ...	65,830.00	67,310.00	71,337.50	897.50	6.16	5.81
Common	20,268.80	4,279.63	20,268.80	76.65	7.16	1.51
	$ 625,898.80	$ 533,465.63	$ 617,154.58	$ 8,087.15	5.69	4.92
Sage fund:						
Bonds	$ 520,000.00	451,654.00	$ 465,668.49	$ 9,307.91	5.49	5.33
Stocks:						
Preferred ...	155,611.25	128,434.13	164,898.76	831.25	7.32	5.70
Common	73,300.00	131,056.00	101,298.62	1,801.50	6.78	8.77
	$ 748,911.25	$ 711,144.13	$ 731,865.87	$ 11,940.66	6.06	5.89
Special endowment fund:						
Bonds	$ 19,000.00	$ 18,311.33	$ 19,398.50	$ 395.83	5.19	4.90
Stocks:						
Preferred ..	360,000.00	343,712.50	434,831.88	4,012.50	6.86	5.42
Common ...	21,400.00	20,436.50	43,709.03	315.00	8.51	3.98
	$ 400,400.00	$ 382,460.33	$ 497,939.41	$ 4,723.33	6.87	5.27
John D. Rockefeller, Jr. fund:						
Bonds	$ 201,000.00	$ 135,620.00	$ 200,760.25	$ 2,312.50	7.41	5.01
Preferred stocks	254,137.50	230,687.51	298,825.01	2,693.75	7.02	5.42
	$ 455,137.50	$ 366,307.51	$ 499,585.26	$ 5,006.25	7.17	5.25
Special trust fund:						
Common stock	$ 16,815.64	$ 5,929.50	$ 16,371.45		7.16	2.59
	$2,247,163.19	$1,999,307.10	$2,362,916.57	$ 29,757.39	6.32	5.35

INVESTMENTS

Summary of Average Yields for Year

	On basis of	
	Quoted value	Book value
	%	%
Bonds	5.78	5.10
Stocks:		
Preferred	6.92	5.50
Common	7.02	6.25
	6.32	5.35

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1931

	Balance January 1, 1931	Additions	Balance December 31, 1931
Restricted endowments:			
Endowment for science and education	$ 89,115.49		$ 89,115.49
Addison Brown Fund..	21,149.31		21,149.31
John Innes Kane Fund.	35,347.63		35,347.63
Maria DeWitt Jesup Fund	25,000.00		25,000.00
Olivia E. and Caroline Phelps Stokes Fund.	3,000.00		3,000.00
Charles Budd Robinson Fund	755.04		755.04
The H. H. Memorial Fund	5,000.00		5,000.00
Alexander P. Anderson and Lydia Anderson Fund	10,000.00		10,000.00
Students' Research Fund	7,096.00	$ 1,466.00	8,562.00
	$ 196,463.47	$ 1,466.00	$ 197,929.47
Unrestricted endowments:			
Endowment Fund.....	$ 232,126.41	$ 6,780.15	$ 238,906.56
David Lydig Fund....	34,337.86		34,337.86
William R. Sands Fund	10,000.00		10,000.00
Darius Ogden Mills Fund	48,099.17		48,099.17
Henry Iden Fund.....	10,000.00		10,000.00
Fanny Bridgham Fund.	30,000.00		30,000.00
Francis Lynde Stetson Fund	25,000.00		25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund.....	784,358.58	248.51	784,607.09
Frances Griscom Parsons Fund.....	2,304.67		2,304.67
Special Endowment Fund	499,038.36		499,038.36
The John D. Rockefeller, Jr., Fund.....	500,000.00		500,000.00
The Charles Patrick Daly and Maria Lydig Daly Fund...	19,636.34		19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00		12,750.00
The George N. Best Fund	3,000.00		3,000.00
	$2,210,651.39	$ 7,028.66	$2,217,680.05
Special Endowments:			
Special Trust Fund ...	$ 21,158.82		$ 21,158.82
	$2,428,273.68	$ 8,494.66	$2,436.768.34

EXHIBIT V

SPECIAL FUNDS

Statements of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1931	Additions	Expenditures	Balance December 31, 1931
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 1,626.14	$ 4,398.74	$ 5,838.60	$ 186.28
Addison Brown Fund:				
Publication of "Addisonia"		3,208.53	3,208.53	
John Innes Kane Fund:				
Plant purchases and expenses	1,335.66	1,744.76	1,066.31	2,014.11
Maria DeWitt Jesup Fund:				
Botanical collections and binding of books.....	378.05	1,234.00	1,495.03	117.02
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	587.62	138.08		725.70
Charles Budd Robinson Fund:				
Exploration	3.13	37.27		40.40
The H. H. Memorial Fund:				
Development of model gardens	385.90	246.80	535.00	97.70
Alexander P. Anderson and Lydia Anderson Fund:				
Research	1,135.73	493.60	225.00	1,404.33
Students' Research Fund:				
Scholarships and prizes.	56.68	350.26	150.00	256.94
	$ 5,508.91	$11,852.04	$12,518.47	$ 4,842.48
Special funds contributed for specific purposes:				
Contributions of trustees of Carnegie Corporation:				
For program of public education	$ 1,957.98	$ 6,000.00	$ 6,124.39	$ 1,833.59
To cover the cost of the installation of a photostat and for equipment..		3,000.00	2,883.67	116.33
To assist in the preparation of the manuscript of an International Address Book of Botanists and Botanical Institutions...		2,000.00	1,623.40	376.60

EXHIBIT V—*Continued*

SPECIAL FUNDS

Statements of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1931	Additions	Expenditures	Balance December 31, 1931
Bequest of William Gilman Thompson, designated by executive committee for construction of shelter house*	5,000.00		348.64	4,651.36
Bequest of William C. Ferguson designated by the donor for mounting of museum specimens and purchase of museum equipment	3,775.32		3,775.32	
Contribution of Henry W. de Forest:				
For botanical exploration		1,500.00	1,434.70	65.30
For Iris paintings		418.00	418.00	
Contribution of National Academy of Sciences for study of fossil flora of Cuba		700.00		700.00
Other restricted contributions		730.97	630.97	100.00
	$10,733.30	$14,348.97	$17,239.09	$ 7,843.18
	$16,242.21	$26,201.01	$29,757.56	$12,685.66

* Re-designated for construction of Thompson Memorial Rock Garden.

REPORT OF THE COMMITTEE ON PATRONS, FELLOWS AND MEMBERS FOR THE YEAR 1931

The Committee on Patrons, Fellows and Members for the year 1931 reports that the number of new members who have qualified, including the 70 persons enrolled in the special gardening courses, is 194. The number of resignations and deaths is 215, a net decrease of 21 members during the year. There are at present 111 Life Members, two Fellowship Members, 120 Sustaining Members and 1701 Annual Members. One person qualified as a Fellow for Life by the payment of $1,000.00. Three persons have qualified as Life Members by the payment of $250.00 each. One hundred Annual Members have qualified as Sustaining Members. Dues collected during the year amounted to $17,670.00.

Of the Annual Members, 171 are now in arrears for dues for 1931; 47 for dues for 1930 and 1931; 32 for dues for the years 1929-1931 inclusive.

Benefactors

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*Mrs. Fanny Bridgham,
*Hon. Addison Brown,
*Andrew Carnegie,
Columbia University,
*Hon. Charles P. Daly,
*James B. Ford,
*Daniel Guggenheim,
Murry Guggenheim,
Edward S. Harkness,
*Mrs. John Innes Kane,
*D. O. Mills,
*J. Pierpont Morgan, Sr.,
J. Pierpont Morgan,
John D. Rockefeller,
John D. Rockefeller, Jr.,
*Mrs. Russell Sage,
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*Cornelius Vanderbilt.

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*Dr. Robert W. de Forest,
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*George J. Gould,
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*Mrs. Esther Herrman,
*Frederick Trevor Hill,
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*Mrs. Mary J. Kingsland,
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Mrs. Frederic S. Lee,
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*Lowell M. Palmer,
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Mrs. Finley J. Shepard,
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Mrs. W. Bayard Cutting,
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